

Does Everything Have to be Gay? Queer Pedagogy in the Undergraduate STEM Classroom

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Queer pedagogy has been underutilized in mathematics learning contexts, particularly at the undergraduate level, despite offering unique perspectives on gender, sexuality, knowledge, and normalcy that are valuable for scientific inquiry and which support queer students in STEM. In this paper I discuss queer pedagogy, present practical examples of its implementation in STEM courses at the undergraduate level and argue for its necessity as a tool for instruction.

Keywords: queer theory, queer pedagogy, mathematical inequity, critical pedagogy

Shortly after I moved across the country to start working on my PhD, I called home to tell my parents all about my “new life.” As we spoke, I described the gay volleyball team I had joined, the local drag show I had attended and emphasized how happy I was to be living in a city with a vibrant queer community. My father, sounding affronted, said, “Not everything you do has to be gay.”

Queer pedagogy has been implemented in arts and social science education for decades as a way to offer homonormative representation and to question the normalization of specific types of authorities, dichotomies, and knowledges (Ferguson, 1989; Letts, 2002; Stafford, 1988; Sullivan, 2003); but queer pedagogy appears to be rare in STEM contexts, particularly at the undergraduate level, despite the opportunities it can provide in supporting queer students, highlighting problematic cultural norms, and contributing to scientific inquiry.

In this paper my aim is to provide a concise explanation of queer pedagogy and to coordinate that explanation with examples of queer pedagogy’s implementation in undergraduate STEM contexts. It is my hope that by linking the theoretical and practical realities of queer pedagogy, queer pedagogy can become more accessible and coherent as an educational tool, and that more scholars and educators will feel empowered to queer their research and their classrooms.

Queer, Queer Theory, and Queer Pedagogy

In order to discuss queer pedagogy, it is first necessary to discuss what is meant by the word “queer” and to investigate the origination of queer pedagogy as an offshoot of queer theory. However, the complexity and history of these movements renders any brief overview of them incomplete and reductive. For this reason, I want to acknowledge that the definitions, histories, and descriptions provided here represent a limited interpretation of queerness, queer theory, and queer pedagogy as dictated by the focus of this work. Should you find yourself curious about other interpretations and dimensions of these topics, I encourage you to explore the cited authors, particularly Nikki Sullivan’s *A Critical Introduction to Queer Theory*, Davey Shlasko’s article “Queer (v.) Pedagogy”, and Deborah Britzman’s book chapter “Is there a Queer Pedagogy? Or, Stop Reading Straight.”

Queer

While it was originally a descriptive verb meaning “odd”, in the early 19th century the word “queer” gained popularity as a pejorative noun for individuals who existed outside of cisgendered and heterosexual expectations of speech, dress, and socialization (Merriam-Webster,

n.d.; Sullivan, 2003). As Western society demonized and pathologized queer behavior in the late 19th and early 20th century, “queer” became synonymous with “deviant” “diseased” or “perverse” and was used primarily as a slur against gender and sexual minorities until its reclamation by queer activists and academics in the mid to late 20th century (Chauncey, 1994; Foucault, 1990; Sullivan, 2003). Now in the early 21st century, “queer” is used colloquially as an umbrella term to refer to anyone within the 2SLGBTQIA+¹ community, and in most instances no longer implies negative connotations. It is now commonplace for researchers to describe sexual and gender minorities within their data as queer (e.g. Cox & Pinheiro, 2024; Leyva et al., 2022; Voigt, 2022), and many 2SLGBTQIA+ individuals, myself included, proudly self-identify as queer.²

Within the academic community the word “queer” expands beyond identity. Morris (1998) proposes that the word “queer” as it is used by queer theorists encompasses three primary meanings: queer as a subject position, queer as a politic, and queer as an aesthetic. Queer as a subject position describes anyone who exists outside of society’s normative understandings of sex and gender and is inclusive of the colloquial and historical meanings of queer described above. Ironically, the drawback to establishing queer as a subject position is that it often reaffirms “the heterosexual center” by defining queerness in contrast to “normalcy” (Davis & Sumara, 2000, p. 123), creating a new binary of “queer-not queer” (Morris, 1998, p. 276). Thus, queer cannot be restricted to a subject position and must also be defined politically. Queer as a politic questions the existence of normalcy, defies assimilation, and advocates for the deconstruction of the boundaries which police gender and sexuality (Luhmann, 1998; Morris, 1998; Shlasko, 2005; Sullivan, 2003). Often, the political use of the word queer is in the form of a verb, and to “queer” something suggests an act of disturbing, resisting, and reshaping. Lastly, queer as an aesthetic intentionally reinterprets writing, art, music, and other forms of text as “politically radical” (Morris, 1998, p. 276), a practice which “queers both text and reader” (Shlasko, 2005, p. 124).

This paper, like many writings on queerness, queer theory, and queer pedagogy, will use the word “queer” as an umbrella term, a subject position, a politic, and as an aesthetic without always making clear which definition is being referenced. Often, several of these definitions are applicable at once and they cannot be reasonably detangled from each other. Rather than stopping to redefine queer each time it appears in this text, I encourage you to embrace the word’s radical and purposeful ambiguity.

Queer Theory

One way to characterize queer theory is as a theory which concerns itself with queer individuals, the queer experience, and queer topics related to gender, sex, and sexuality (Shlasko,

¹Two-spirit, lesbian, gay, bisexual, transgender, queer/questioning, intersex, asexual/aromantic

²It is notable that while queer may describe an individual’s gender or sexual orientation, it often erases or neglects other important aspects of an individual’s identity, particularly race and class (Barnard, 1999; Sullivan, 2003). This has resulted in a homogenized view of queerness which favors white middle-class portraits of homosexuality (Mercer, 1994) and reproduces racial marginalization (Barnard, 1999; Leyva, McNeill, Balmer, et al., 2022; Sullivan, 2003). While it is not a focus of this paper, I want to acknowledge that queer studies are frequently complicit in ignoring the racialized nature of queerness. For a primer on this topic, see “Queer Race” by Ian Barnard (1999).

2005; Sullivan, 2003; Voigt, 2022). But more broadly, and consistent with Morris' (1998) definition of queer as a politic, Fifield and Letts expressed that:

Queer theory shares concerns around sociocultural power relations of life in sexed and gendered bodies while troubling attempts to treat sexuality, or anything else, as a stable and knowable marker of identity. Queer theory includes unruly, deconstructivist perspectives that destabilize dominant norms around sexuality, gender, bodies, knowledge, power, and identity by imagining and inhabiting alternatives that resist being fully known or explicable. (2019, p. 68)

Queer theory can focus on queer topics of gender and sexuality, but it also leverages queerness to criticize anything that society has deemed to be normal and to consider how that normalcy can be disturbed. Queer theory also offers opportunities to reflect on the personal and political nature of identity, and, as Voigt (2022, p. 4) described it, “offer[s] alternative ways of thinking and performing in the world”.

Queer theory can also be understood as an epistemological stance which questions what is known and what can be known (Dubbs, 2016; Letts, 2002), a stance which resonates with modern explorations of education, learning, and instruction and which I see as foundational to the development of queer pedagogy.

Queer Pedagogy

As with queer theory, queer pedagogy is not solely concerned with queer individuals or queer representation, going beyond “merely adding authentic or likable portrayals of lesbian/gay icons to an otherwise straight—and already overcrowded—curriculum” (Luhmann, 1998, p. 124). Instead, it can be understood as an application of queer theory and queer politic to instruction. Flessas and Zimmerman (2019, p. 96) explained queer pedagogy as “encouraging critical thought and the willingness to delve into complexity; investigating, questioning, and re-evaluating assumptions; and interrogating processes of normalization...” By this definition, I see queer pedagogy as having a home among the critical pedagogies which have gained popularity in the mathematics education community. In fact, Shlasko (2005, p. 125) citing Spurlin (2002) argued that queer pedagogy is at the “intersection of queer theory and progressive pedagogy” and I contend that many of the critical pedagogies that have emerged as part of the sociopolitical turn in mathematics education are implicitly queer.

Rands (2009) described a queer pedagogy of mathematics as mathematical inqueery³, which “brings queer theory’s interrogatory edge into the intersection with pedagogy and mathematics to mathematize the queer and queer mathematics” (Rands, 2019, p. 64). Mathematical inqueery encourages discomfort with abnormality, and its application has been compared to working with alternate number bases or non-Euclidean geometry (Rands, 2019; Sheldon, 2019). Ultimately, queer pedagogy and mathematical inqueery attempt to trouble normative presentations of gender and sexuality while exploring what can lie outside of “binaries such as homo-hetero, ignorance-knowledge, learner-teacher, reader-writer, and so on” (Luhmann, 1998, p. 128).

³Mathematical inqueery is sometimes written as mathematical inqu[ee]ry to highlight the intersections of queerness and inquiry and to emphasize a disregard for conventional grammar (Sheldon, 2019). I enjoy this styling of the word but have chosen not to include the brackets as part of an effort to make this paper more accessible to those who use screen readers.

Queer Pedagogy in Undergraduate STEM Classrooms

There are countless ways to apply queer pedagogy to the undergraduate STEM classroom, and the examples provided in this report are neither exhaustive nor irreproachable. In the words of Letts and Fifield (2019, p. 5) in their introduction to *STEM of Desire*, “we suggest you approach particular definitions of queering STEM education as provisional orientations, not as determinative demarcations of proper and improper queering.”

My choice to discuss lessons constructed by Helene Götschel and James Sheldon is twofold. First, I feel that their work illustrates the explicit integration of queer pedagogy into a realistic academic context and can serve as inspiration for undergraduate educators interested in queering anything from a single task to an entire course. Second, Götschel and Sheldon share valuable insights on how and why queer pedagogy was an appropriate choice for their classrooms, insights which strengthen my argument for the necessity of queer pedagogy in undergraduate STEM.

Queering Physics with Helene Götschel

In Götschel’s (2019) book chapter “Teaching Queering Physics: An Agenda for Research and Practice” she detailed two of her recent attempts to teach physics “in a queering way” by presenting non-normative versions of typical physics learning tasks.

In the first task Götschel (2019) modified a lesson on angular momentum to feature male figure skater Evgeni Plushenko rather than the female figure skater presented by the textbook. To introduce this lesson to her students, Götschel played clips from several of Plushenko’s skating routines. The male engineers in her class were “visibly uneasy” while studying Plushenko’s skating routines and giggled as they watched the skater perform incredible feats of athleticism while using his body in “feminine” ways (p. 136). Götschel attributed the discomfort displayed by her students as a result of the masculine body that is expected and upheld in physics classrooms.

In the second task, Götschel (2019) had students work through a standard kinematics exercise, calculating whether or not an antelope running from a lion could escape its predator over a set course of time. Once this calculation was finished, Götschel showed her students a short film featuring several lionesses working together to hunt a zebra and used this film to prompt a discussion of variables like acceleration, change of direction, and the use of teamwork, aspects which are typically neglected in rectilinear presentations of the task. She described this film as giving students the opportunity not just to think about additional kinematic variables, but also as a chance to question the notions of active masculinity and passive femininity as they play out in physics.

Both of these tasks queer physics through the use of queer pedagogy because they “make the familiar strange” and disrupt the culture of physics classrooms and curricula without sacrificing the rigor of the learning objective (Götschel, 2019, p. 126). In the first task, Götschel’s (2019) choice to highlight the masculine body in an artistic setting forces students to sit with the discomfort of their own gendered assumptions and to question how physicists evaluate movement scientifically, politically, and aesthetically. In the second task, students are given the opportunity to question what is lost when physics tasks focus on unrealistic and rectilinear presentations of speed and distance while deconstructing the dichotomies of male-female and individualism-collectivism. Götschel’s instructional choices within these tasks demonstrate how queer pedagogy does not have to overshadow a lesson’s primary focus but can offer a layer of radicality with subtle alterations to existing curricular materials.

James Sheldon's Queer Curriculum of Infinity

In Sheldon and Rands (2013), the authors discussed the queerness of many mathematical topics, naming infinity, topology, imaginary numbers, complex analysis, and decomposition as topics ripe for the queer pedagogy of mathematical inqueery. A few years later, Sheldon (2019) chose to focus on infinity as an inherently queer topic and used queer pedagogy and the queer aesthetic to explore infinity in a five-week course on mathematical problem solving. This course included lessons on counting, modular arithmetic, set theory, and other topics which required an understanding of mathematical infinity, but rather than teaching infinity as a singular lesson at the beginning or end of the course, Sheldon embedded discussions of infinity into every lesson. Sheldon described using the *Hotel Infinity* videos from Dr. Tova Brown, and historical accounts taken from *The Mystery of the Aleph* by Amir D. Aczel to show students the complicated and messy human history surrounding infinity rather than presenting it solely as a mathematical object. As Sheldon described it, he “invited students to feel the sense of the mystery, fascination, power, intrigue, drama, and contradictions that infinity entails. ... entangling them in infinity’s web rather than straightening out their experience of queer mathematics” (Sheldon, 2019, p. 316).

Sheldon’s approach to queer pedagogy, and specifically the use of mathematical inqueery, was embedded in the course’s design, shifting the student’s focus from *definitions* of infinity to the *history* and *story* of infinity, a choice which I consider abnormal in standard mathematical instruction. This instructional choice is queer precisely because it offers an approach to learning mathematics that is aesthetically oriented while still conveying the necessary material. Sheldon’s queer curriculum of infinity also gave students an opportunity to question how definitions and theorems are created and accepted by the mathematical community and to understand mathematics as a human process rather than a scientific eventuality.

The queerness of Sheldon’s curricula may seem less obvious than Götschel’s, having no direct references to gender, sexuality or identity, but the course’s design mirrors epistemological stances in queer theory; it asks what students “cannot bear to know” (Britzman, 2014, p. 214) and invites them to sit with the queer tensions between humanity and infinity.

The Necessity of Queer Pedagogy in Undergraduate STEM: “Queer Students Deserve Nothing Less” (Shlasko, 2005, p. 125)

As Dubbs (2016, pp. 1041-1042) stated, “the ability to consider sexuality irrelevant in the mathematics context is a heteronormatively privileged position; for queer students, their queerness, indeed *otherness*, is intersectional across social contexts.” The teaching and learning of mathematics hinges on identity (Gutiérrez, 2013) and every classroom contains queer students who deserve to see themselves represented within the curriculum. STEM subjects are socially, culturally, and politically motivated and reproduce the inequities present within society as a whole; as long as queerness remains marginalized within society, queer students and perspectives will remain marginalized within STEM. I assert that queer pedagogy provides a vital opportunity for students of all genders and sexualities to feel more supported in STEM classrooms, to problematize societal constructions of normalcy, and to reacquaint themselves with the joy of scientific inquiry. In the remainder of this section, I explain how I see queer pedagogy accomplishing these things and specify the importance of this undertaking in an undergraduate setting.

Marginalized students deserve additional support in traditional mathematics classrooms, and queer students are no exception. In a recent quantitative study of queer-spectrum students in undergraduate mathematics courses, Voigt (2022) found that sexual identity had a significant

relationship with a student's mathematical learning experience and their ability to access learning environments when compared to non-queer identifying peers. The study also revealed that when using a regression model, the effect sizes of sexual identity were similar to the effect sizes of race, gender, and first-generation college student status (Voigt, 2022). Additionally, sexual minorities have been found to leave STEM degrees at a higher rate than their heterosexual peers (Hughes, 2018) and in some instances view the pursuit of STEM degrees as dually alienating since they face pressure to remain invisible within the STEM classroom while they are simultaneously underrepresented in queer discourses (Toynnton, 2007). These findings support an understanding of queer students as marginalized individuals in the academic environment and suggest a need for practices which support queer students, queered STEM curricula, and queer pedagogy as a visible discourse in STEM.

Consider Götschel's (2019) tasks on queering physics. To my knowledge, students in the classroom, queer or otherwise, were not aware of the instructor's intent to use queer pedagogy. However, because Götschel's tasks were designed to encourage students to face implicit biases in their understanding of gender, movement, and society, I see that she created an opportunity for queer students to connect more deeply with the topics being studied and to see their peers interact positively with topics which are often left outside of the classroom (namely gendered presentation and gendered bodies). Societal expectations regarding gender, presentation, desire, and sexuality oppress and affect *all* students (Götschel, 2019; Gunckel, 2019; Rands, 2013) and I posit that by confronting these topics within the physics classroom (Götschel, 2019), students of all identities were given the opportunity to question the normalcy of these social constructs in a safe and healthy environment without deviating from important curricular topics such as speed, acceleration, and angular momentum.

An additional benefit of using queer pedagogy in undergraduate STEM classrooms is that I see queer pedagogy as being compatible with the tenets of scientific inquiry. Queer pedagogy questions knowledge and reality, exploring alternative ways of knowing and understanding the world, even when those understandings differ from the norm. The same can be said of scientists and mathematicians who, for the sake of argument, I will characterize as creators of tools for learning about and understanding reality. When these mathematicians and scientists take part in the creation of math and science, they are queering (disrupting/interrogating) normalcy, knowledge, and constructs as we currently understand them. In discussing queer theory, Britzman (2014) described what one can know and "cannot bear to know" (p. 214), and to me these words feel just as relevant to scientific inquiry as they do to the field of queer studies.

Sheldon's (2019) queer curriculum of infinity is an excellent example of queer pedagogy upholding the principles of scientific inquiry. His implementation of queer pedagogy encouraged students to question mathematical concepts and definitions, a curricular choice which I feel reintroduces the joy of creation and discovery which is foundational to the study of mathematics. By inviting students to linger in the nonbinary space between knowledge and ignorance (Luhmann, 1998) I posit that Sheldon's students were allowed the rare privilege of acting as mathematicians themselves while learning about mathematicians of the past.

Finally, I must address why my argument is constructed specifically as an appeal to undergraduate educators rather than to educators as a whole. While I firmly believe that queer pedagogy is valuable to students of any age (particularly because queer pedagogy often does not concern queer topics), it is only at the undergraduate level that the long held (and fallacious) argument that discussions of gender and sexuality are not "appropriate" for children (Fla. Legis. House Bill 1557: Parental Rights in Education, 2022) is rendered moot. There is also evidence to

suggest that college students who have positive interactions with queer students are more likely to have positive attitudes towards queer relationships (Liang & Alimo, 2005). To me, this implies that undergraduate classrooms are ideally situated to implement queer pedagogy and provide young people the opportunity to learn tolerance, find acceptance, and expand their scientific mind. Yet, when reading relevant literature on the use of queer pedagogy in STEM, K-12 contexts appeared to be more common. Sheldon (2019) and Götschel's (2019) work were two of a limited number of studies which explicitly cited queer pedagogy in an undergraduate STEM context. For this reason, I find it necessary to encourage the conscious expansion of queer pedagogy into undergraduate STEM curricula, as I see a gap in the field of queer pedagogy at this level.

Conclusion

Queer pedagogy encourages “studying the risks of normalization, the limits of its own practices, and the im/possibilities of (subversive) teaching and learning” (Luhmann, 1998, p. 130), and as mathematics education researchers continue to advocate for more equitable teaching and learning practices, queer pedagogy has much to offer. I contend that queer pedagogy is a powerful tool for studying gender, sexuality, identity, knowledge, and authority, topics which are relevant within the undergraduate STEM curriculum as demonstrated by Götschel (2019) and Sheldon (2019). Additionally, queer pedagogy provides the opportunity to uplift queer voices, support critical perspectives, and encourage students to participate in the interrogative cycle of scientific discovery.

In the future, I intend to study the intersection of queer pedagogy and other critical discourses, and to uplift racialized aspects of queerness which are frequently neglected in the queer community (Leyva, McNeill, Balmer, et al., 2022). To that end, I invite researchers to consider how queer pedagogy might be compatible with their work, and to reflect on how, disassociating race, gender, and sexuality ... can lead to the production of accounts of race that are (at least implicitly) sexist and or/ homophobic, theories of gender that are (at least implicitly) racists and/or homophobic, and analyses of sexuality that are (at least implicitly) racist and/or sexist (Sullivan, 2003, p. 66).

It is impossible to isolate gendered and sexualized experiences from other experiences of marginalization and I hope to contribute to the coordination of these discourses alongside other scholars who have done exemplary work discussing the racialized and gendered realities of undergraduate classrooms (e.g. Brockenbrough, 2016; Leyva et al., 2021; Leyva, McNeill, & Duran, 2022; McNeill et al., 2022)

I also intend to use queer pedagogy in my research as a tool for queer readings (Britzman, 2014) of proof, queer proof validation, and queer guided reinventions through the use of realistic mathematics education (Freudenthal, 1972). Additional topics which may benefit from the use of queer pedagogy are studies which concern student identity, mathematics identities, and studies which question the construction of mathematics as a stable and fixed.

“Not everything you do has to be gay.” At the time, my father's words left me chagrined, and I was quick to reassure him that my queer experiences represented only a fraction of who I was and what I did. Now I have a better answer to his indictment: Does everything “have to be gay?” Maybe not. But I challenge the idea that there is any value in trying to dissect my life into categories like “gay” and “not gay”. My experience of mathematics is a queer experience of mathematics, and my life, my teaching, and my research is all the better for it.

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