

What Does 2SLGBTQIA+ Identity and Other Non-Normative Identities Have to Do With Mathematics Teaching and Learning?

B Waid

The Queer Mathematics Teacher

Abstract

In the last decade or so, many educators, researchers, and national and local mathematics organizations have sought to create targeted programs, frameworks, and educational supports (for teachers and students alike) to address disparities in who we see as a “math person” and who has access to high quality mathematics. Too often, however, queer and transgender people are left out of these initiatives, frameworks, and conversations about equity and increased representation. Many times, the exclusion of queer and transgender identities from talks of equity, diversity, and inclusion comes from the ways in which queer and transgender identity is often rendered invisible, “divisive,” or irrelevant in PK-12, and sometimes even PK-16, settings, particularly in mathematics. This article provides an argument as to *why* considering queer and transgender identity in mathematics teaching and learning is not only relevant, but essential. The article also provides considerations for making our schools and mathematics classes more queer and transgender inclusive.

Note: This article is an adaptation of a TODOS Live! session of the same title, given by B Waid on September 21, 2022, available at <https://vimeo.com/761876288>.

Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

1. What is one question you have about the experiences of 2SLGBTQIA+ (Two Spirit, lesbian, gay, bisexual / bi-gender/ biromantic, transgender, queer, intersex, agender / asexual / aromantic, and other gender and sexual minorities) students in your mathematics classroom or in your school?
2. Think back to your PK-12 or PK-16 schooling. What aspects of your identity were deeply tied to the development of your mathematics identity and your learning of mathematics?
3. Write down one thought you have about how 2SLGBTQIA+ identity might be related to mathematics teaching and learning.

B Waid, Ph.D. (they/she or elle/ella) is an independent math coach and activist-scholar. She is the founder of The Queer Mathematics Teacher (QMT) and co-founder of Radical Pedagogy Institute (RPI). She obtained her PhD in Mathematics Education from Columbia University and formerly served as an Assistant Professor of Teacher Education at Drew University. She has also taught middle and high school mathematics in both New York City and Central Florida. B's research and work at QMT and RPI centers on using a queer lens to challenge traditional practices in mathematics teaching. To learn more about her work or to contact B, visit the QMT website at www.TheQueerMathematicsTeacher.com or the RPI website at www.RadicalPedagogyInstitute.com

Content Warning: The author feels this article warrants a content warning, not because it deals with 2SLGBTQIA+ identity, but because it contains references to violence against queer and trans youth (as well as youth of other marginalized identities), trauma and self-harm, and state-sanctioned genocide and land theft against Indigenous peoples. If you or someone you love identifies as 2SLGBTQIA+ and/or Indigenous (or even BIPOC and/or disabled), or if you have past experiences of trauma or self-harm, please practice self-care as you engage with this article and know that the author believes in your beauty and brilliance.

What Does 2SLGBTQIA+ Identity and Other Non-Normative Identities Have to Do With Mathematics Teaching and Learning?

B Waid

As I write from a coffeeshop near my home, I acknowledge that as a queer demi-woman¹ of settler-colonial ancestry extending from Cuba, Lebanon, France, Spain, and England, I have benefited tremendously from living on Turtle Island, what many of us now know as the Americas. As I gaze out the window, I take in the beautiful ancestral lands of the Lenni Lenape, in an area known as Lenapehoking, shown in Figure 1.

As Figure 1 illustrates, the Lenape residing in Lenapehoking, pre-colonization, spoke three dialects, indicating three distinct, yet interrelated communities - the Munsee (meaning “People of the Stony Country”), Unami (meaning “People Down River”), and Unalachtigo (meaning “People Who Live Near the Ocean”) (Nanticoke Lenni-Lenape, n.d.). I reside on the ancestral lands of the Munsee Lenape, known as diplomats and warriors by many neighboring communities of Lenapehoking. Some of the first Indigenous people to encounter the European colonizers. Due to violent and forced relocations Westward, as well as mass genocide, much of the present-day Lenape population resides in Oklahoma, Wisconsin, and Ontario, though there remain Lenape peoples in southern Lenapehoking. Those people are known as the Nanticoke Lenni-Lenape, with their name indicating a merging of the Nanticoke and Lenape peoples. Many of the Lenape people that remained in Lenapehoking survived by adapting to the dominant, settler colonial ways, becoming farmers and traders, while working to preserve their role as “keepers of the land.”

Figure 1
Lenapehoking



Note. From Lenapehoking [Image], by Wikipedia
<https://en.wikipedia.org/wiki/Lenape>

In reflecting on what I have come to learn about the history of the Nanticoke Lenni-Lenape peoples and their resilience and dedication to the land, community, and culture, I am drawn to the ways of a subgroup of the Lenape people—those known today as Two Spirit. To understand Two Spirit identities, we must first recognize the sacred role of land and spirituality in Indigenous cultures. The element of spirituality, rather than the body

identity doesn't feel quite right. For me, in those moments, I feel more aligned with a non-binary gender identity.

¹ For me, the demi-woman (or demi-girl) identity means that I mostly identify as a woman, but there are also times when that

or sex assigned at birth, was at the core of the pre-colonial Indigenous concept of gender. In line with this spiritual understanding of gender, Two Spirit persons embody both male and female spirits and are gifted with skills and abilities that transcend a gender binary. As such, many pre-colonial Indigenous cultures looked beyond a binary conception of gender, recognizing three or more genders. In those times, Two Spirit identified tribal members were considered honored members of the community and given important roles such as healers, keepers of language and culture, mediators, educators, and caregivers of orphaned children and elders (Bronska, 2019).

Unfortunately, the honored customs surrounding Two Spirit identity were considered “immoral” by European Christian colonizers, who began violently imposing their binary conception of gender and gender roles upon Indigenous communities. This led to the eradication of many Two Spirit tribal members and Two Spirit traditions, whether through direct genocide or in the forced “reeducation” of Indigenous peoples, through means such as American Indian Boarding schools. It was not until 1990 that Indigenous people of tribes across Turtle Island came together to create the unifying term “Two Spirit”² as a broad replacement for the traditional terms that had been lost to colonization and to begin reclaiming the sacred position Two Spirited Indigenous people held within their communities (Bronska, 2019).

I begin my discussion here in this historical understanding of Two Spirit identity and Indigenous cultures for several reasons. First, I believe it is essential that we authentically engage with the historical context, especially that of Indigenous land theft and cultural genocide, of the lands on which we occupy. Second, I find that this historical account provides context for the continued violence that Two Spirit, lesbian, gay, bisexual / bi-gender / biromantic, transgender, queer, intersex, agender / asexual / aromantic, and other gender and sexual minority youth (which I will henceforth refer to by using the acronym 2SLGBTQIA+)³ face in our PK-16 systems and greater society.

² Prior to 1990, many tribes had their own word for two-spirited individuals.

³ While many may be more familiar with other versions of this acronym that begin with the letters L, G, B, T, I use this version of the acronym to honor the fact that Two Spirit identities were in existence on Turtle Island long before other Western gender identities and sexual orientations. I credit TODOS president

Experiences of 2SLGBTQIA+ Students

Over the last few decades, our institutions and governments have moved from more overt campaigns of state sanctioned violence against non-dominant / non-normative identities (i.e., those who are not White, cisgender, heterosexual, Christian, able-bodied, and, to some extent, men) through measures such as cultural genocide (e.g., the use of American Indian Boarding Schools. As a means of mass genocide of Indigenous peoples and their cultures), land theft and slavery, to more covert mechanisms of violence that exist to erase or silence non-dominant / non-normative identities. Schools are not exempt from these covert mechanisms of oppression. In truth, our schools remain sites of violence for many queer and trans Black, Indigenous, and people of color (QTBIPOC), disabled individuals, and Black, Indigenous, and people of color (BIPOC) that do not identify as queer, trans, or disabled. To illustrate this, one only need to turn to the results of GLSEN’s⁴ National School Climate Survey (Kosciw et al., 2020), administered every two years. As of 2019 (the most recent data available at the time of this writing), 86% of 2SLGBTQIA+ students surveyed in secondary schools indicated within the last year they had been harassed or assaulted at school “due to personal characteristics, including sexual orientation, gender expression, gender, and actual or perceived race and ethnicity, religion, and disability” (p. 28).

As we are mathematics educators, let’s think about this in terms of total number of students. In 2019, the population of 2SLGBTQIA+ students in secondary schools are members of Generation Z. It has been estimated that approximately 21% of Generation Z identify as 2SLGBTQIA+ (Jones, 2022)⁵. If there were approximately 15.3 million students enrolled in high schools across the United States in 2019 (Bouchrika, 2022) and 21% of those students were 2SLGBTQIA+ identified, then that would mean that we might expect approximately 3,213,000 high school aged students to identify as 2SLGBTQIA+. Calculating 86% of those

Florence Glanfield for reframing my thinking in this area to adopt the version of this acronym that puts Two Spirit first.

⁴ GLSEN <https://www.glsen.org/> is the leading education organization for 2SLGBTQIA+ advocacy and research.

⁵ This data is from 2021. When Gallup polled Generation Z in 2017, 11% had identified as 2SLGBTQIA+.

2SLGBTQIA+ students, we would estimate that some 2,763,180 2SLGBTQIA+ students were harassed or assaulted in U.S. secondary schools in 2019 based on “personal characteristics.” That is a lot of students... and these are only the numbers for students who identify as 2SLGBTQIA+ students, not those who do not identify as 2SLGBTQIA+, but are BIPOC, and/or disabled, nor those who are *perceived* to be 2SLGBTQIA+ due to non-normative gender expression⁶.

The educational impact of hostile school climates cannot be understated and is compounded for students whose identities exist at the intersections of multiple systems of oppression⁷. The cumulative impact of hostile school environments and discrimination leads to higher levels of school truancy, lower GPAs, and lower self-esteem (Kosciw et al., 2020). It has also been linked to the overrepresentation of 2SLGBTQIA+ students, especially QTBIPOC students and queer and trans students with disabilities, that experience adolescent homelessness (Robinson, 2021), engage in risky behavior (e.g., drug use, self-harm) (Garnett et al., 2014; Hatchel and Marx, 2018), and that enter the school-to-prison pipeline as adolescents (Snapp et al., 2015). Furthermore, we cannot assume that experiences of hostile school climates are limited to high-school aged 2SLGBTQIA+ students, since normative identities are taught and reinforced from the day students enter schooling. As Keenan (2017) notes, schools work to categorize children’s bodies in various ways (by race, ethnicity, ability, gender, intelligence, behavioral traits, language proficiency, etc.) from the moment they set foot in preschool. Keenan writes that the words used for these categories “are used to sort out who is ‘normal’ and who is ‘different’” (p. 540). In terms of the categories used to sort “normal” versus “different” gender identities (and later sexual orientation), Keenan writes,

Although Dick and Jane books and the practice of walking children down hallways in parallel boys’ and girls’ lines have faded from view in most US schools, children continue to be taught that being a girl means one set of behaviors and roles associated with growing up into a woman (e.g., playing with other

girls, being sexually attracted to boys, caretaking, expressing emotion, wearing dresses) and being a boy means another, quite different set of behaviors and roles associated with growing up into a man (e.g., playing with other boys, being sexually attracted to girls, being physically active and aggressive, never wearing dresses). All of this works together to teach children a script about which kinds of bodies are normal and which are not (p. 540).

In failing to address this hidden curriculum (or “script”) as it develops at the earliest grades of schooling and beyond, we are creating educational environments in which 2SLGBTQIA+ identity is taboo, something unusual to be feared. As such, we should not be surprised that the result is a hostile and unsafe school experience for those that identify as 2SLGBTQIA+, are part of 2SLGBTQIA+ families, or are perceived to be 2SLGBTQIA+.

While the results of GLSEN’s 2021 National Climate Survey (<http://bit.ly/3Y2XGKa>) were not available at the time of this writing, it is anticipated that the finding for 2021 will be no better, given our current sociopolitical climate, which has become increasingly hostile toward 2SLGBTQIA+ identities, as well as other identities that are not White, cisgendered, heterosexual, and male. The result of these hostilities to non-normative identities has led to a rising number of:

- “Don’t Say Gay” bans that limit or completely forbid the discussion of 2SLGBTQIA+ issues, people, and identity.
- “Critical Race Theory” bans that limit or completely forbid discussion of or inclusion of accurate representations of historical or present-day issues of race, racial justice, racial bias, and discussions of social and emotional learning.
- the repeal of Roe v. Wade and the accompanying concurring opinion from Justice Clarence Thomas that urged that various key 2SLGBTQIA+ civil rights cases (e.g., marriage equality, decriminalization of same sex relationships) be reconsidered and overturned.
- legislative attacks on families of transgender students who have supported their transgender

⁶ Gender expression refers to a person’s outward expression of gender and may include things such as mannerism, hairstyle, clothing, make-up, voice, interests, etc.

⁷ In 2019, GLSEN found that just over 80% of QTBIPOC individuals heard racist remarks at school in the past year and

approximately 4% experienced racial harassment in the past school year. GLSEN also found that just over 60% of 2SLGBTQIA+ undocumented students felt unsafe at school because of their citizenship status in 2019, a sharp increase from the approximately 40% in 2017.

teens in their desire to socially or medically transition.

- transgender sports bans, which predominantly target transgender girls, prohibiting transgender students from participating in school sports that align with their gender identity.
- legislative attempts to increase Immigration Customs Enforcement (ICE) raids and remove the sanctuary status of institutions such as schools.

Some may assume that 2SLGBTQIA+ youth (or possibly all youth) are not paying attention to these issues, however, there is evidence to the contrary. The Trevor Project (2022) found that 94% of surveyed 2SLGBTQIA+ identified youth reported that the current political climate had negatively impacted their mental health and expressed particular concern about the rights of Black and trans folx⁸.

Impact of Trauma on Learning and Cognition

Why does all this matter and what does it have to do with 2SLGBTQIA+ students in PK-16 mathematics? To understand these questions, one first needs to understand the impact of trauma on learning and cognition. I define trauma here in a similar fashion as that of the Substance Abuse and Mental Health Services Administration (2014), which states, “Individual trauma results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or life threatening and that has lasting adverse effects on the individual’s functioning and mental, physical, social, emotional, or spiritual well-being” (p. 7). 2SLGBTQIA+ students who are disproportionately impacted by discrimination, harassment, and assault at schools, in addition to the rejection (and violence) that many 2SLGBTQIA+ students face from their families and communities, would fall under this definition of trauma (McCormick et al., 2018), as would students who experience forms of systemic trauma due to their Black, Brown, Indigenous, and/or disabled identities (Venet, 2021).

In response to this trauma, the brain develops trauma responses that serve to help an individual cope. Psychotherapist and trauma specialist Resmaa Menakem (2017) elaborates on this, writing,

Trauma responses are unique to each person. Each response is influenced by a person’s particular physical, mental, emotional, and social makeup—and, of course, by the precipitating experiences themselves. However, trauma is never a personal failing, and it is never something a person can choose. It is always something that happens *to* someone. A traumatic response usually sets in quickly—too quickly to involve the rational brain. Indeed, a traumatic response temporarily overrides the rational brain (pp. 7-8).

Contrary to popular belief, trauma responses are not only the result of a single traumatic event (though that is possible as well), but they can also develop from a series of smaller wounds, sustained over time⁹ (Menakem, 2017; Venet, 2021). This indicates that trauma responses might form in response to the “slow violence” (Gutiérrez, 2018) of multiple years of microaggressions on both the systemic and individual level.

In addition to allowing individuals to cope, trauma responses also serve as a protective mechanism in any situation that has the potential to retraumatize an individual, whether that potential is realized or merely perceived. To illustrate this, Hammond (2015) discusses what happens to our brains when we are in such an environment or situation. Hammond describes how our autonomic nervous system is programmed to scan our environment for threats and send that information to the Reticular Activating System and amygdala, which in turn send a “distress signal” to our body, which begins developing stress hormones. These hormones significantly hinder our ability to learn. Hammond writes,

Even if the environment isn’t hostile but simply unwelcoming, the brain doesn’t produce enough oxytocin and begins to experience anxiety. This anxiety triggers the sympathetic nervous system, making one think [they] are in danger because the brain doesn’t experience a sense of community....When we look at the stress some

like us” (Kapitan, 2016). Thus, my use of this term intricately tied to my Latinx, Queer identity.

⁸ This is a mistaken belief that folx is spelled with an x to make it gender neutral. Folx is spelled with an x here (and throughout this article) to honor the advocacy work of Latinx, Black, Indigenous, and other POC activists in the 2SLGBTQIA+ community, who use the term folx in solidarity to mean “folks

⁹ This is known as Complex Post-Traumatic Stress Disorder (C-PTSD).

students experience in the classroom because they belong to marginalized communities because of race, class, language, [sexual orientation], or gender [identity], we have to understand their safety-threat detection system is already cued to be on alert for social and psychological threats based on past experience. It becomes imperative to build positive social relationships that signal to the brain a sense of physical, psychological, and social safety so that learning is possible (p. 45).

As we can see from Hammond's quoted text, if we are not providing environments where 2SLGBTQIA+, BIPOC, and disabled students can not only feel safe (physically, psychologically, and socially), but also that foster a sense of belonging, then the conditions necessary to foster learning have not been met.

During adolescence, we know that the brain is still in the early stages of development and considered to be most “plastic.” As such, the impact of traumatic experiences in adolescence has very real consequences to our brain structures. It is nearly impossible to escape such brain-altering trauma for 2SLGBTQIA+ students, who are bombarded with messages that who they are is unacceptable, unwanted, and even despised, both inside and outside of school. This also extends to BIPOC and disabled folx, whether they are 2SLGBTQIA+ or not. The impact of this trauma has significant consequences in terms of student learning. McInerney and McKlindon (2014) write, “Children who have experienced trauma may find it more challenging than their peers to pay attention and process new information, and evidence suggests that some of these children develop sensory processing difficulties …” (p. 4). They also note that for adolescents that have experienced such trauma, there are noted impacts on the way that they interact with others, either withdrawing from social situations or becoming more negative and bullying other students. Past trauma may also lead students to become distrustful of teachers and authority figures in general and could impact the development of problem-solving skills, creativity, and curiosity (Nelson et al., 2022), which are skills and dispositions that align with competencies emphasized in high quality mathematics teaching (National Research Council, 2001).

Impact of Trauma on Mathematics Learning and Cognition

Thinking in terms of mathematics specifically, Seda and Brown (2021) discuss how “math classrooms are *especially* [emphasis mine] prone to traumatizing events because of the emphasis on speed and accuracy, individual performances, student labeling, one-shot tests, and a long history of cultural negativity” (p. 69). Many of these practices point to a mathematics that is gendered (as masculine), heterosexual, and White (Esmonde, 2011; Gutiérrez, 2017; Leyva, 2017; Martin, 2012; Mendick, 2006; Waid et al., 2021; Yeh & Otis, 2019; Yeh and Rubel, 2020). In addition to the above practices of pedagogical trauma, 2SLGBTQIA+ students also experience curricular violence / trauma in their PK-16 schooling by having their identities erased, portrayed as trivial or complicating things, or irrelevant to mathematics contexts (Bright, 2016; Parise, 2021; Rubel, 2016; Waid, 2020; Waid, 2021; Waid & Turner, 2021).

The above examples of pedagogical and curricular violence / trauma that 2SLGBTQIA+ students experience in mathematics as a discipline might help to explain why 2SLGBTQIA+ individuals are underrepresented at every level of PK-16 mathematics and in the STEM workforce. In PK-12 schools, 2SLGBTQIA+ students are less likely to take Algebra II (Whipple, 2018), often seen as a gatekeeper to higher level mathematics; in post-secondary settings, 2SLGBTQIA+ students are less likely to major in STEM (Greathouse et al., 2018), and those who choose a STEM major are less likely to persist in that major (Hughes, 2018). Similarly, after graduating with a STEM degree, 2SLGBTQIA+ students are less likely to enter STEM fields (Freeman, 2020) and, if they do, are less likely to remain in those fields (Cech and Waidzunas, 2021). All of this points to a field of mathematics (and STEM more broadly) that is inherently hostile to 2SLGBTQIA+ identities.

What Can Mathematics Educators Do?

So, what can mathematics educators do? My first recommendation is two-pronged. For current

2SLGBTQIA+, BIPOC, and disabled students¹⁰ in our classes and schools (i.e., those who have already experienced harm in our school and societal systems), we must adopt trauma-informed practices that center equity and social justice. Venet writes “[t]rauma-informed educational practices respond to the impact of trauma on the entire school community and prevent further trauma from occurring. Equity and social justice are key concerns of trauma-informed educators as we make changes in our individual practice, in classrooms, in school, and in district-wide and state-wide systems.” (p. 10). Venet also states that centering these practices in equity means “ensuring that all students can access high-quality education, that they are fully included in their school communities, that they are able to engage in meaningful and challenging academic work, and that they can do all of this in an environment that values them as people” (p. 22).

Using this foundation of equity and trauma-informed practice, Venet identifies a framework of four trauma-informed priorities that we might use in our decision-making as teachers: predictability, flexibility, empowerment, and connection. A description of each of these priorities, along with examples of what they might look like in a mathematics classroom, are depicted in the sections below¹¹.

Predictability

Predictability refers to structures or routines that are consistent, while also maintaining flexibility (the next priority). These structures help those impacted by trauma find grounding and comfort / safety. One example of predictability in mathematics that I have described elsewhere (Waid, in press) is the use of regular check-ins at the end of each class period or at the end of each week. The check in, which usually appears in the form of an exit ticket, asks students to reflect on the question “What are you thinking or feeling in relation to what we learned today?” When introducing this activity at the start of the school year, I inform students that their reflection can take whatever shape makes most sense to them, meaning they can reflect on the content of what they learned (e.g., “I’m

still struggling with..., “I feel really good about...”), my pedagogy (e.g., “I really like the ___ strategy you used because ...,” “I didn’t find ___ strategy helpful because ...”), classroom dynamics (e.g., “I’m finding it hard to work with ___ because...,” “I worked well with ___ because..,” “I liked working alone on this assignment because...,” “I liked working in groups on this assignment because...”), their affect (e.g., “I was having a bad day today,” “I was struggling to pay attention because I didn’t sleep well last night”) or anything else they find relevant. I find that the predictability of this activity and the question structure provides students with a sense of comfort, while also allowing them to engage in authentic reflection and communicate their needs to me so that I might be more responsive in future lessons. Other examples of predictability in mathematics might include utilizing community agreements or group work norms, having standard procedures for retaking or resubmitting work, outlining exactly what student performance will be evaluated upon (through a rubric or some other means), the use of predictable math routines (e.g., Quick Images, Choral Counting, I Notice, I Wonder, Which One Doesn’t Belong), and so on.

Flexibility

Flexibility is about meeting students where they are and prioritizing their humanity over all else. While maintaining high academic standards is important, allowing for flexibility in how students meet those standards is also essential. Likewise, while providing structure (which might also fall under the above priority of predictability) is important, being flexible with policies in ways that are context-specific is a hallmark of trauma-informed practice. Seda and Brown’s (2021) discussion of the use of “Totally Ten Choice Boards” provides an example of flexibility in mathematics teaching practice. On a Totally Ten Choice Board, “[s]tudents choose the questions, worth varying number of points, they want to answer, as long as their points total to a certain number” (pp. 151 - 152). They further note that “[t]eachers can specify that students choose at least one question for each level” (p. 152).

¹⁰ Here I do not mean to imply that we will always *know* which students identify in these ways, but to acknowledge that we should *always* teach as though there are students who identify

¹¹ Special shout out/thank you to Alex Venet for looking these examples over and providing feedback!

In terms of policy in the mathematics classroom, one example of flexible policy might be the implementation of flexible or rolling deadlines that do not penalize students when they are not prepared to submit work by the suggested deadline date. Other examples of flexibility in mathematics might include differentiating instruction, utilizing low floor-high ceiling math tasks, eliminating zero tolerance policies, standards-based grading or ungrading, and implementing choice in other areas such as seating arrangements, options for collaborations, etc.

Empowerment

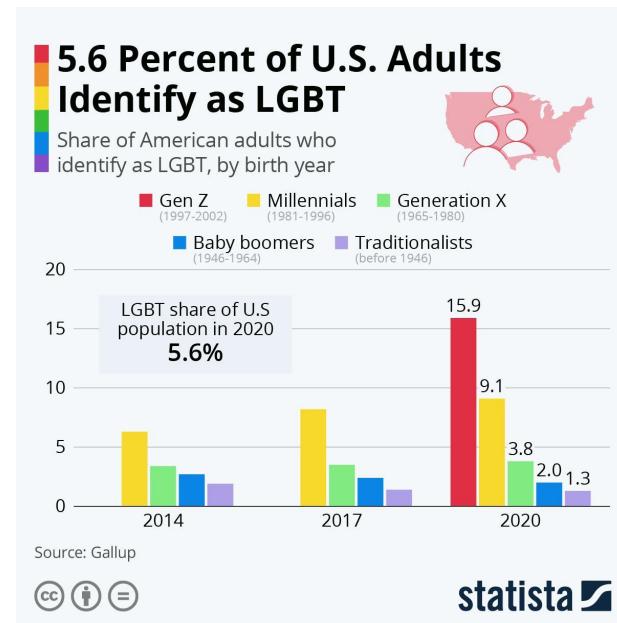
The priority of empowerment, which is deeply tied to student agency, is nicely captured in a 2019 tweet by Venet, which says “I like to say: empowerment in a trauma-informed context doesn't mean ‘feeling good about yourself.’ It means literally giving power TO, sharing power WITH.” One method of empowering students that I have utilized in my mathematics classrooms, is the use of routines such as “I Notice, I Wonder.” In a summer camp I run for 2SLGBTQIA+ youth entering grades 9-12, I have used this routine to develop an entire unit of study, based on students posed questions. For example, one summer I knew I wanted to have students learn about various types of functions, so I provided them with a Statista (2021) graph, which showed the results of a Gallup Poll that asked respondents if they identified as LGBT. The graph, shown in Figure 2, showed respondent answers, by generation, in the survey's 2014, 2017, and 2020 administrations. Knowing the students would pose a question related to the overall percentage of individuals that identified as LGBT in each of these years, I also had a second graph (Statista, 2022), shown in Figure 3, ready to complete a second round of the “I Notice, I Wonder” routine, one that would allow students to begin posing questions about predicting identification as LGBT in future years. By selecting these images, and steering students toward questions of future prediction, students felt empowered in their role in contributing to the overall design of the lessons that followed - lessons centering on various types of functions, function families (especially linear, polynomial,

exponential, and logarithmic, and rational functions), and transformations of those functions.¹²

Similarly, Seda and Brown (2021), discuss a modified use of the “I Notice, I Wonder” that might happen in a single lesson that is already planned (rather than a sequence of lessons as I describe in my previous example). This modified routine has students write five factual things about the graph or problem they are noticing and wondering about, as well as two questions about the graph or problem. Students' questions and observations are recorded on the board, without judgment. Students' observations and questions can then be used as a transition into the day's lesson, structured in a way that honors their observations and questions. At the end of the lesson, Seda and Brown recommend “revisit[ing] the original statements and ask[ing] students to respond by saying, ‘I agree, because...’ or ‘I disagree because...’” (p. 127). Other examples of empowerment in mathematics might include co-constructing community agreements and group work norms with students, asking students for regular feedback on your teaching (what's

Figure 2

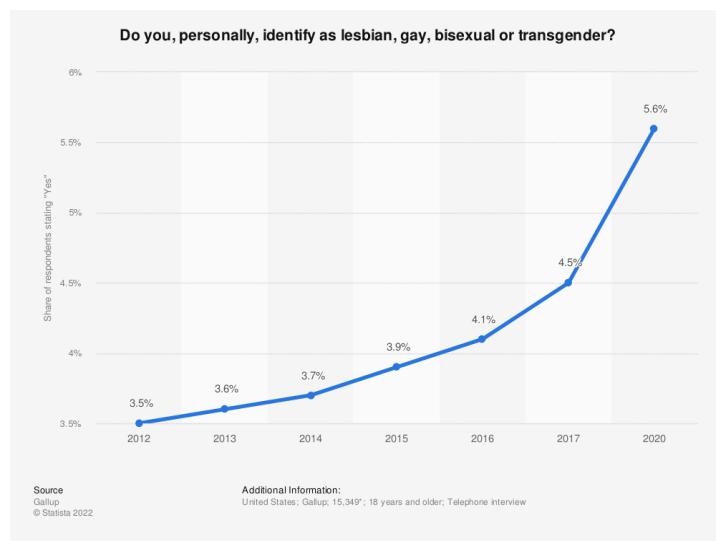
Percentage of U.S. Adults, by Generation, who Identify as LGBT (Statista, 2021)



¹² For a more detailed description of this task and the lessons / activities that followed, please see Waid, n.d.a: <https://bit.ly/3Hbih9A>

Figure 3

Overall Percentage of U.S. Adults who Identify as LGBT (Statista, 2022)



working, what's not working?) and adapting accordingly, utilizing student interest to develop mathematics tasks and projects, implementing choice in assignments or other areas such as seating arrangements, options for collaborations, and so on.

Connection

Connection refers to the building of community, collaboration, and relationships. One practice that fosters connection, which I have used in my own mathematics classroom and discussed elsewhere (Waid, in press), involves placing emphasis on community over content in mathematics teaching and learning. Currently, teachers feel constrained by the content they must “cover” in mathematics. This tension often leads teachers to spend the first week or so of their classes on community building activities and focusing on dispositions and then moving on to center mathematics content, without revisiting these essential community building practices. In my chapter for TODOS’s forthcoming book centered on the themes outlined in TODOS’s position statement *The Mo(ve)ment to Prioritize Antiracist Mathematics* (2020), I discuss this practice by drawing upon the following metaphor (manuscript p. 8),

“If these activities are the sole efforts of community building, then this can be likened to the process of digging a hole, placing a plant in the ground, and watering it once, with the hope that these actions will be enough to sustain the plant. For most plants,

such actions are not enough. The same is true for students when we are building community.”

I then discuss how I use bi-weekly “community agreement check-ins” that allow students to reflect on which community agreements need greater attention and support (as well as if community agreements need modification). Based on the results of this check-in, I develop a participation quiz (similar to those described in Cohen & Lotan, 2014) which lists behaviors that embody the identified community agreement. For example, if students have selected a community agreement that centers on active listening, I would provide a list of behaviors that are indicative of active listening such as, positioning one’s body to indicate you are listening, asking follow-up questions for understanding, rephrasing someone’s understanding, etc. These behaviors would then be used by the entire classroom community to provide feedback over the next few weeks, with constructive feedback being shared in *all* directions: from teacher to student, student to student, and student to teacher. Other examples of connection in mathematics might include using collaborative group work and discourse rich practices such as Smith and Stein’s (2018) five practices structure, providing time and mechanisms to check-in with students and allow them to engage in self-reflection (possibly through the check-ins I described in my example under the priority of predictability), utilizing student interests and cultural funds of knowledge to develop mathematics tasks and projects, etc.

In addition to the classroom practices mentioned above, teachers must also work toward shifting overall school culture and dismantling the mechanisms of systemic trauma that harm BIPOC, disabled, and 2SLGBTQIA+ students. For example, in terms of 2SLGBTQIA+ identity, GLSEN has consistently found the following four practices to support an affirming school climate (Kosciw et al., 2020):

- The presence of a school-sanctioned gender sexuality alliance
- Comprehensive anti-discrimination and anti-bullying policies that explicitly include 2SLGBTQIA+ identity as protected
- Hiring 2SLGBTQIA+ affirming and identified teachers and staff
- Implementing 2SLGBTQIA+ inclusive curriculum *across all content areas*.¹³

While there is evidence that simply affirming a student's 2SLGBTQIA+, disabled, and/or BIPOC identity can lead to the development of a stronger, more positive mathematics identity (Fischer, 2013; Aguirre et al., 2013), we must go beyond this. This is where my second, more mathematics-specific, recommendation comes in. While creating affirming, inclusive environments and implementing inclusive mathematics curriculum is essential, we also need to reconsider our preconceived notions about mathematics. Present notions are heavily influenced by European ideologies of White Supremacy, heteropatriarchy, and ableism, and have led us to a field of mathematics dominated by Cisgendered, heterosexual, able-bodied, White men (Leyva, 2017; Gutiérrez, 2013; Lambert et al., 2018).

How do we begin reimagining and expanding the limits of who and what is considered mathematical? For me, the answer lies in learning from Indigenous, disabled, and queer and trans communities (especially QTBIPOC and disabled queer and trans communities). Against all odds, these communities, particularly young people, and those living at the intersection of interlocking systems of oppression, have found ways to build community, find joy, and thrive. In the face of being told who they should be, less they face the wrath of society, many in these communities have continued to find ways to be authentic and forge new paths, while "failing" to align with societal

norms. In thinking about this type of "failing," Queer author Jack Halberstam writes, "under certain circumstances failing, losing, forgetting, unmaking, undoing, unbecoming, not knowing may in fact offer more creative, more cooperative, more surprising ways of being in the world. Failing is something queers do and have always done exceptionally well" (pp. 2-3). The same can be said of BIPOC and disabled folx, in terms of "failing" to bend to normative, dominant ideologies. Elaborating on this point, scholars Engel and Lyle (2021) write, "these alternatives regularly require that we get lost—as it were—and fail to walk prescribed lines in thought and in body. In short, failure means refusing to practice endorsed modes of thinking and doing and being to see what else comes into view when one detours non-normativity" (p. 15).

What might mathematics look like if we follow the example of queer and trans, disabled, Indigenous, and QTBIPOC individuals, stepping off the well-travelled path that our past mathematical experiences taught us was "acceptable" and wandering into the weeds to see what new possibilities come into view? One such vision of mathematics comes from a series of lessons I developed for "Camp" of Mathematical Queeries, a camp I design and implement every summer for 2SLGBTQIA+ identified youth entering grades 9-12. Throughout "camp" experiences, I attempt to infuse cross-disciplinary lessons that allow students to see the connection between mathematics, history, English, and queer culture and identity. One such lesson began with the posing of the question, "How many ways are there to be queer?" This question, simple, yet profound, provides students an opportunity to gain a sociocultural and historical perspective of models that have been used by scientists (e.g., Kinsey Scale, Benjamin Scale, and Storms Axes) and gender theorists (e.g., Genderbread person and Gender Unicorn) to "mathematically" understand queer and trans identities. The question also provides multiple avenues of mathematical investigation such as:

- reviewing the number line and various number systems (e.g., real, irrational, rational, integers)
- introducing mathematical terms such as line, ray, segment, continuous, discontinuous, and hole

¹³ See bit.ly/MathQueeriesHub for examples of inclusive mathematics tasks (Waid, n.d.b).

- exploring concepts of sets, including finite vs infinite sets, as well as cardinality
- developing an understanding of theoretical versus experimental sample spaces and probability
- investigating appropriate mathematical notations, including interval notation and inequalities.

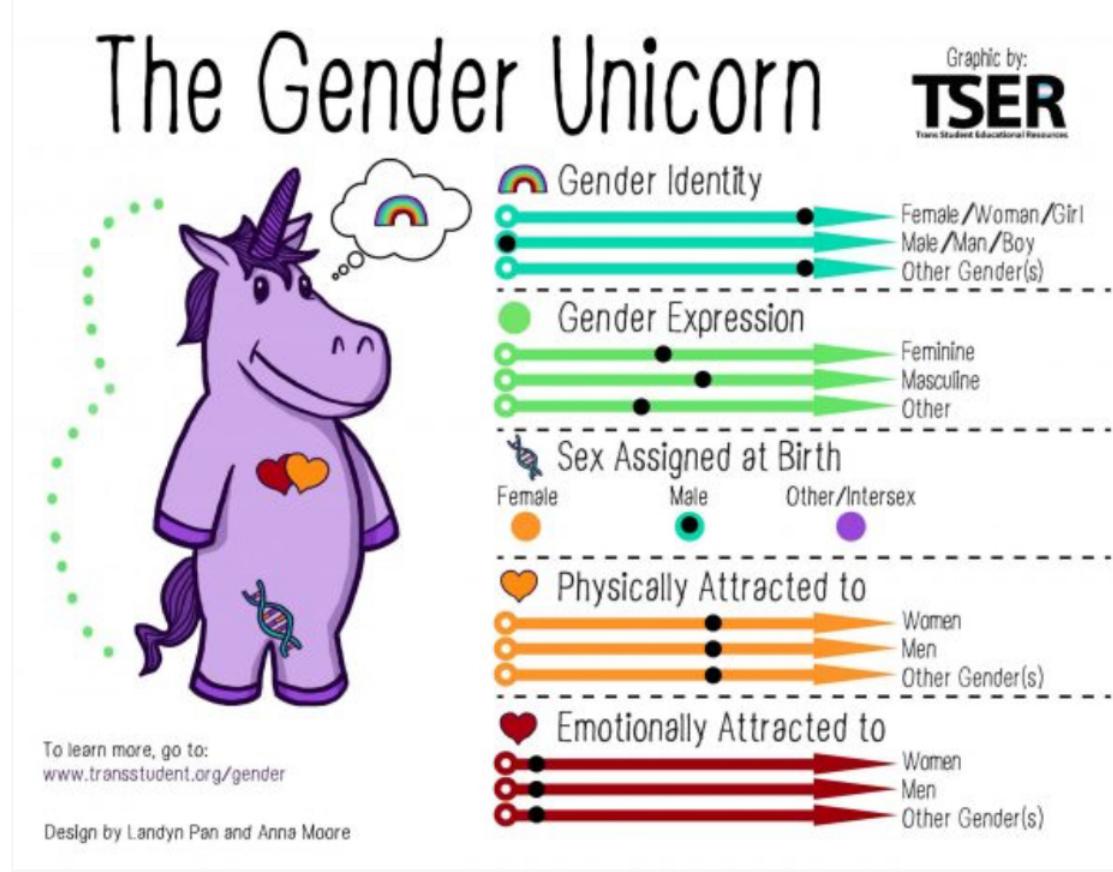
For example, the Gender Unicorn Model, shown in Figure 4, depicts several rays that one might use to identify their gender identity, gender expression, physical attraction, and romantic attraction. Introducing this model provides an opportunity to introduce or reinforce the vocabulary of a ray (as opposed to a line or segment), and an understanding of mathematical notations that might describe the scale (e.g., ranging from 0, inclusive, to infinity). Next, students use their mathematical and sociocultural / historical knowledge to provide critiques

of the gender and sexuality models and propose new, more inclusive models that build on their mathematical understandings and their belief about how many ways there are to be queer.

As mathematics educators, we must collaboratively brainstorm ideas, such as the one offered above, which transcend the boundaries of what we consider “traditional” mathematics. We must also collaboratively brainstorm how such ideas might be realized in our classrooms, given the limitations of our current education system, as well as in our work of challenging and dismantling those systems. This sort of radical freedom dreaming (Love, 2019) is needed to create mathematics classrooms that are truly equitable for 2SLGBTQIA+, Black and Brown, and disabled students alike, as well as all PK-16 students.

Figure 4

The Gender Unicorn.



Note. From *The Gender Unicorn* [Image], by Trans Student Educational Resources.
<https://transstudent.org/gender/>

A Call to Action

For those interested in exploring other avenues of reimagining mathematics by honoring the wisdom of queer, trans, and Indigenous ways of being in the world, TODOS: Mathematics for ALL has two special interest groups, TODXS= (pronounced “toe dax equals”) and Educators of Native American Students (EONAS), designed for us to come together and realize this potential. Come join us in the reimagining of mathematics education, as we work to better support all our students, especially those that identify outside the norm and dare to transgress societal boundaries. If you are *already* a TODOS member and want to join TODXS= or EONAS, please visit https://bit.ly/TODOS_Add; otherwise, please visit <https://www.todos-math.org/join-todos-> and click “join now” and make sure to select TODXS= and/ or EONAS as you complete the application process.

References

Aguirre, J. M., Mayfield-Ingram, K., & Martin, D. B. (2013). *The impact of identity in K-8 mathematics: Rethinking equity-based practices*. National Council of Teachers of Mathematics.

Bouchrika, I. (2022, September 13). 101 American school statistics: 2021/2022 data trends and predictions. Research.com.
<https://bit.ly/3kxKTRI>

Bright, A. (2016). The problem with story problems. *Rethinking Schools*, 30(4), 14-19.

Bronski, M. (2019). *A queer history of the United States for young people* (Vol. 1). Beacon Press.

Cohen, E. G., & Lotan, R. A. (2014). *Designing groupwork: Strategies for the heterogeneous classroom* (3rd ed.). Teachers College Press.

Cech, E. A., & Waidzunas, T. J. (2021). Systemic inequalities for LGBTQ professionals in STEM. *Science Advances*, 7(3), eabe0933.

Engel, S. M., & Lyle, T. S. (2021). *Disrupting dignity: Rethinking power and progress in LGBTQ Lives*. New York University Press.

Esmonde, I. (2011). Snips and snails and puppy dogs' tails: Genderism and mathematics education. *For the Learning of Mathematics*, 31(2), 27-31.

Fischer, D. J. (2013). *Out 4 math: The intersection of queer identity and mathematical identity*. (Doctoral dissertation, Drexel University).

Freeman, J. B. (2020). Measuring and resolving LGBTQ disparities in STEM. *Policy Insights from the Behavioral and Brain Sciences*, 7(2), 141-148.

Garnett, B. R., Masyn, K. E., Austin, S. B., Miller, M., Williams, D. R., & Viswanath, K. (2014). The intersectionality of discrimination attributes and bullying among youth: An applied latent class analysis. *Journal of Youth and Adolescence*, 43(8), 1225-1239.

Greathouse, M., Brckalorenz, A., Hoban, M., Huesman, R., Rankin, S., & Stolzenberg, E. B. (2018). *Queer-spectrum and trans-spectrum student experiences in American higher education: The analyses of national survey findings*. Rutgers Tyler Clementi Center.

Gutiérrez, R. (2013). Why (urban) mathematics teachers need political knowledge. *Journal of Urban Mathematics Education*, 6(2), 7-19.

Gutiérrez, R. (2017). Why mathematics (education) was late to the backlash party: The need for a revolution. *Journal of Urban Mathematics Education*, 10(2), 8-24.

Gutiérrez, R. (2018). Introduction: The need to rehumanize mathematics. In I. Goffney, R. Gutiérrez, & M. Boston (Eds.), *Rehumanizing mathematics for Black, Indigenous, and Latinx students* (pp. 1-10). National Council of Teachers of Mathematics.

Halberstam, J. (2011). *The queer art of failure*. Duke University Press.

Hammond, Z. L. (2014). *Culturally responsive teaching and the brain: Promoting authentic engagement and rigor among culturally and linguistically diverse students*. Corwin.

Harris, M., & Fallot, R. (2009). *Creating cultures of trauma-informed care (CCTIC): A self-assessment and planning protocol*.
<https://bit.ly/3iTXYUL>

Hatchel, T., & Marx, R. (2018). Understanding intersectionality and resiliency among transgender adolescents: Exploring pathways among peer victimization, school belonging, and drug use. *International Journal of Environmental Research and Public Health*, 15(6), 1289.

Hughes, B. E. (2018). Coming out in STEM: Factors affecting retention of sexual minority STEM students. *Science Advances*, 4(3), eaao6373.

Jones, J.M. (2022, February 17). LGBT identification in U.S. ticks up to 7.1%. Gallup.
<https://bit.ly/3XPzFWJ>

Kapitan, A. (2016, September 12). Ask a radical copy editor: Folx. Radicalcopyeditor.com.
<https://bit.ly/3J6ABli>

Kean, E. (2021). Advancing a critical trans framework for education. *Curriculum Inquiry*, 51(2), 261-286.

Keenan, H. B. (2017). Unscripting curriculum: Toward a critical trans pedagogy. *Harvard Educational Review*, 38(4), 538-556.

Kosciw, J. G., Clark, C. M., Truong, N. L., & Zongrone, A. D. (2020). *The 2019 national school climate survey: The experiences of lesbian, gay, bisexual, transgender, and queer youth in our nation's schools*. Gay, Lesbian and Straight Education Network (GLSEN).

Lambert, R., Tan, P., Hunt, J., & Candela, A. G. (2018). Rehumanizing the mathematics education of students with disabilities; Critical perspectives on research and practice. *Investigations in Mathematics Learning*, 10(3), 129-132.

Leyva, L. A. (2017). Unpacking the male superiority myth and masculinization of mathematics at the intersections: A review of research on gender in mathematics education. *Journal for Research in Mathematics Education*, 48(4), 397-433.

Love, B. L. (2019). *We want to do more than survive: Abolitionist teaching and the pursuit of educational freedom*. Beacon Press.

Martin, D. B. (2012). Learning mathematics while Black. *The Journal of Educational Foundations*, 26(1&2), 47-66.

McCormick, A., Scheyd, K., & Terrazas, S. (2018). Trauma-informed care and LGBTQ youth: Considerations for advancing practice with youth with trauma experiences. *Families in society*, 99(2), 160-169.

McInerney, M., & McKlindon, A. (2014). *Unlocking the door to learning: Trauma-informed classrooms and transformational schools*. Educational Law Center. <https://bit.ly/3H2STkS>

Menakem, R. (2017) *My grandmother's hands: Racialized trauma and the pathways to mending our hearts and bodies*. Central Recovery Press.

Mendick, H. (2006). *Masculinities in mathematics*. McGraw-Hill Education (UK).

Nanticoke Lenni-Lenape (n.d.) Our tribal history... <https://nanticoke-lenape.info/history.htm>

National Research Council, & Mathematics Learning Study Committee. (2001). *Adding it up: Helping children learn mathematics*. National Academies Press.

Nelson, K., Peterson, K. McMillin, L., & Clarke, K. (2022). Imperfect and flexible: Using trauma-informed practice to guide instruction, *Libraries and the Academy*, 22(1), 177-197.

Parise, M. M. (2021). Gender, sex, and heteronormativity in high school statistics textbooks. *Mathematics Education Research Journal*, 33(4), 757-785.

Robinson, B. A. (2021). "They peed on my shoes": foregrounding intersectional minority stress in understanding LGBTQ youth homelessness. *Journal of LGBT Youth*, 2021(May), 1-17.

Rubel, L. H. (2016). Speaking up and speaking out about gender in mathematics. *The Mathematics Teacher*, 109(6), 434-439.

SAMHSA Trauma and Justice Strategic Initiative (2014). *SAMHSA's concept of trauma and guidance for a trauma-informed approach*. Substance Abuse and Mental Health Services Administration. <https://bit.ly/3XKoNdj>

Seda, P., & Brown, K. (2021). *Choosing to see: A framework for equity in the math classroom*. Dave Burgess Consulting, Inc.

Smith, M., & Stein, M. K. (2018). *5 Practices for orchestrating productive mathematics discussion*. National Council of Teachers of Mathematics.

Snapp, S. D., Hoenig, J. M., Fields, A., & Russell, S. T. (2015). Messy, butch, and queer: LGBTQ youth and the school-to-prison pipeline. *Journal of Adolescent Research*, 30(1), 57-82.

Statista (2021). *5.6 percent of U.S. adults identify as LGBT*. <https://bit.ly/3GXMQOI>

Statista (2022). *Americans who identify as gay, lesbian, bisexual, or transgender 2012-2020*. <https://bit.ly/3DtWA2j>

Stewart-Ambo, T., & Yang, K. W. (2021). Beyond land acknowledgment in settler institutions. *Social Text*, 39(1), 21-46.

Thomas, H. (2021, October 8). Why our trauma-informed teaching must be more culturally responsive. EdSurge. <https://bit.ly/3iX1sWy>

TODOS Mathematics for All. (2020). The mo(ve)ment to prioritize antiracist mathematics: Planning for this and every school year. <https://bit.ly/3j5Yvip>

Venet, A. S. [@AlexSVenet]. (2019, February 13). *I like to say: empowerment in a trauma-informed context doesn't mean 'feeling good about yourself.' It means literally giving power to, sharing power with*. [Tweet]. Twitter. <https://bit.ly/3wprmW1>

Venet, A. S. (2021, April 10). Equity-centered, trauma-informed teaching with Alex Venet (No. 90) [Audio podcast episode]. In *Human restoration project*. <https://bit.ly/3J6RZ9x>

Venet, A. S. (2021). *Equity-centered trauma-informed education*. W.W. Norton & Company.

Waid, B. E. (n.d.). American identification as gay, lesbian, bisexual, transgender or something other than heterosexual. The Queer Mathematics Teacher. <https://bit.ly/3Hbih9A>

Waid, B. E. (n.d.). Mathematical queeries: A hub of free, QMT created math activities. The Queer Mathematics Teacher. <https://bit.ly/MathQueeriesHub>

Waid, B. E. (2020). Supporting LGBTQ+ students in K-12 mathematics. *Mathematics Teacher: Learning and Teaching PK-12*, 113(11), 874-884.

Waid, B. E. (2021). “The condo problem”: Musings of a queer mathematics educator. *Mathematics Teacher: Learning and Teaching PK-12*, 114(5), e12-e15.

Waid, B. E. (forthcoming). Liberatory, anti-racist mathematics education for Black, queer and trans youth. In M. Strutchen (Ed.), *Advocacy and action steps toward antiracist mathematics teaching and learning*. TODOS: Mathematics for ALL.

Waid, B. E., & Turner, K. H. (2021). Inqu[ee]ry across the curriculum. *English Journal*, 110(3), 82-88.

Waid, B. E., Velamur, A., Moore, A. S., & Whipple, K. S. (2021). Disrupting normativity in mathematics education: Meeting queer students at the intersection of their queer and mathematics identities. In *Exploring new ways to connect: Proceedings of the Eleventh International Mathematics Education and Society Conference* (pp. 119 - 121). Tredition.

Whipple, K. S. (2018). *LGBTQ secondary mathematics educators: Their identities and their classrooms* (Doctoral dissertation, University of Minnesota).

Wikipedia (n.d.). *Lenapehoking*. <https://en.wikipedia.org/wiki/Lenape>

Yeh, C., & Otis, B. M. (2019). Mathematics for whom: Reframing and humanizing mathematics. *Occasional Paper Series*, 2019(41), 85-98.

Yeh, C., & Rubel, L. (2020). Queering mathematics: Disrupting binary oppositions in mathematics pre-service teacher education. In N. Radakovic & L. Jan (Eds.), *Borders in mathematics pre-service teacher education* (pp. 227-243). Springer, Cham.

Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. In the DARE Pre-Reading questions, you were asked to record one idea for how 2SLGBTQIA+ identity might be related to mathematics teaching and learning. How has this thought evolved or changed as a result of reading this article?
2. What is one step you might take today to make your school or mathematics classes more inclusive for 2SLGBTQIA+ students?
3. Try this: the article shares several trauma-informed practices based on four trauma informed teaching priorities, proposed by Venet (2021). Select one strategy to begin implementing in your classroom today.
4. Try this: GLSEN’s National School Climate Survey provides a picture of the experiences of 2SLGBTQIA+ in schools across the United States. If you’re looking for more contextual data, you can check out GLSEN’s “state snapshot” documents (<http://bit.ly/3DmehAN>) or conduct a school local climate study at your own school (<https://localsurvey.glsen.org>).