

5-2020

## How to create a radically inclusive math classroom with regards to gender and sexual orientation

Alexa DeVore  
*University of Northern Iowa*

Copyright ©2020 Alexa DeVore

Follow this and additional works at: <https://scholarworks.uni.edu/hpt>

 Part of the [Science and Mathematics Education Commons](#), and the [Secondary Education Commons](#)

*Let us know how access to this document benefits you*

---

### Recommended Citation

DeVore, Alexa, "How to create a radically inclusive math classroom with regards to gender and sexual orientation" (2020). *Honors Program Theses*. 427.  
<https://scholarworks.uni.edu/hpt/427>

This Open Access Honors Program Thesis is brought to you for free and open access by the Honors Program at UNI ScholarWorks. It has been accepted for inclusion in Honors Program Theses by an authorized administrator of UNI ScholarWorks. For more information, please contact [scholarworks@uni.edu](mailto:scholarworks@uni.edu).

HOW TO CREATE A RADICALLY INCLUSIVE MATH CLASSROOM  
WITH REGARDS TO GENDER AND SEXUAL ORIENTATION

A Thesis Submitted  
in Partial Fulfillment  
of the Requirements for the Designation  
University Honors

Alexa DeVore  
University of Northern Iowa  
May 2020

This Study by: Alexa DeVore

Entitled: How to Create a Radically Inclusive Math Classroom with Regards to Gender and Sexual Orientation

has been approved as meeting the thesis or project requirement for the Designation

University Honors

\_\_\_\_\_  
Date

\_\_\_\_\_  
Dr. Catherine Miller, Honors Thesis Advisor

\_\_\_\_\_  
Date

\_\_\_\_\_  
Dr. Jessica Moon, Director, University Honors Program

## **Abstract**

An extensive literature review was conducted to analyze how a secondary mathematics teacher can best support female and LGBTQ students. While extensive research has been conducted about the gender gap in STEM, concerning female students, little research has been done that includes LGBTQ students. While female students have made great improvements in mathematics participation and achievement, there is still work to be done. LGBTQ students face similar difficulties as female students but have not received the same attention and research as female students. This research indicates there are more things teachers should be doing to support students who have been historically marginalized in mathematics.

I am a senior in the Mathematics Teaching program at UNI. My worldview has been greatly impacted by my experiences both in my classes and through my outside of class activities. My work as a Resident Assistant, summer camp counselor, and Tutor-Mentor for the Classic Upward Bound summer program has given me opportunities to interact with individuals from a diverse set of backgrounds and learn how their lives have been shaped by the education they received. This has compelled me to think about what kind of teacher I want to be. The type of classroom I want to create is one that is beyond just content, but one that is also an affirming environment for all. The purpose of my honor's thesis is to provide practical advice and general information to grades 7 through 12 mathematics teachers to help them create an inclusive classroom that will best support the learning of all students. I believe that when we affirm the identities of all of our students, we legitimize their existence and potentials as learners. If we are affirming of our students for who they are and the academic potential they possess, then I believe students' academic performances will improve.

The following two research questions will be the focus of my research.

1. How can a secondary mathematics teacher create a radically inclusive mathematics classroom with regards to genders of students?
2. How can a secondary mathematics teacher create a radically inclusive mathematics classroom with regards to sexual orientation identities of students?

The gender gap in STEM (science, technology, engineering and mathematics) has been a hot topic in recent years but most of this research has been limited to supporting female students. I will seek to expand upon this and understand how LGBTQ (lesbian, gay, bisexual and transgender) students are, or are not supported. After understanding what the issues are in

mathematics classrooms and high schools in general, I will seek to find strategies that secondary mathematics teachers can implement to better support and teach students of these identities.

### **Methods**

To answer my research questions, I conducted an extensive literature review to find out what research tells us about the success of marginalized students in secondary mathematics classes. I paid attention to research on female and other marginalized student identities, since research on supporting students of non-normative gender identities is scarce. Using various Internet search tools, I was able to find a wide variety of articles to use in my research. The research I found addressed topics that include LGBTQ students' struggles and needs in secondary education, the gender gap in STEM achievement and participation, and actions for high school teachers to implement into their classrooms to improve support for all students. I was also able to utilize the websites of reputable organizations devoted to these populations of students such as GLSEN (Gay, Lesbian and Straight Education Alliance) and Teaching Tolerance. With these materials I was able to better understand these topics and identify themes that helped to answer my research questions. In addition to articles, I also found several books that directly related to my research. The most helpful were books related to the sociology of education, pertaining to diversity. There were also mathematics education books related to diversity and inclusion that were relevant to this research. In total, I read over 30 sources to find the information that would be most applicable to my research. I was able to highlight or tag each piece of information that I thought was beneficial from the digital sources. Similarly, I was able to use sticky notes to mark key pieces of information in my written sources. These strategies made it possible for me to find important pieces of information and themes, and reference them while I was writing.

## **Data Analysis**

After I had read all my sources, I went back and reviewed my materials and organized my key pieces of information into the following three categories:

- Understanding LGBTQ and female secondary students
- Problems in secondary schools and mathematics, and
- Actions taken by secondary teachers to create inclusive classrooms for LGBTQ and female students

This allowed me to identify themes within the research I read. It soon became apparent that I needed to define my terms carefully, understand the problems facing the students who were the focus of my research and seek to identify strategies secondary mathematics teachers can use to support these students and their learning. As I combined my key pieces of information, I revisited articles, chapters, webpages or books as needed to explore the themes I identified as key to my work. Throughout this review of relevant research and sources, I kept track of what I read, the author's names and page numbers of especially relevant passages. With this I was able to answer my research question.

## **Literature Review**

The term “inclusive” is defined by Merriam-Webster as “including everyone especially: allowing and accommodating people who have historically been excluded (as because of their race, gender, sexuality, or ability),” (2019). For this research, I have attached the adverb “radically” to inclusive as a way to bring intensity and impact to this idea. While the idea of inclusivity has become a buzzword, I intentionally chose to look at “radical inclusivity” because I am wanting to go beyond the normal expectations and think critically about how we can improve our classrooms for these populations of students. This research is also focused on

secondary mathematics classrooms, specifically grades 7 through 12, which includes courses such as 7th grade math, 8th grade math (typically pre-algebra content), Algebra 1, Geometry, Algebra 2, Precalculus, Calculus, and a few other classes sometimes taught in high schools. I investigated research in all STEM areas, to find enough research and other information related to my research question. Mathematics is interwoven in all of these areas and is therefore necessary to succeed in any of these fields. Therefore if students want to pursue any STEM career, they need to be able to succeed and feel competent in mathematics.

My research interest in this specific topic was sparked from thinking about supporting female students in mathematics. Historically, women have been thought to be less successful in STEM areas and less likely to pursue STEM related careers. This is often referred to as the “Gender Gap” in STEM. However, if we are going to recognize the fact that gender exists on a spectrum rather than a binary, focusing solely on women is inadequate. Here at UNI, gender is defined as “a person’s identity defined by their own internal feelings and experiences of self, which may include connections to physical experiences” (Gender Identity Terminology, 2019). This explains why gender is often described as a spectrum or continuum, and does not occur in a binary. Some explanations of gender also explain that gender is something you “do” versus being something you are because it is not fixed throughout time. In this interpretation, gender can be understood as a verb versus just being a noun (Skelton et al. 2006). This is why my research question includes more than women.

One of the common misconceptions regarding gender is thinking the terms “sex” and “gender” are the same. The term sex refers to physical attributes, often through a medical or legal lens. It is important to note that an individual’s gender identity does not always align with what society would expect for someone of their legal sex. Gender identity exists in a variety of



ways, often described as a spectrum from masculine to feminine, allowing gender identity to exist in limitless different ways. This shows how gender is more complex than just the common understanding of “boy” and “girl.” Therefore, that is why it is insufficient to research gender issues only as a binary.

For the sake of this research, I will be focusing on two main identities of students: gender and sexual orientation. When I refer to gender, I am considering cisgender females and transgender students. Cisgender is the term used for when one’s gender identity aligns strongly with the sex they were assigned at birth. Historically, cisgender females have been thought to lag behind cisgender males in mathematics, so it is appropriate to see how this differential is affecting students today. The term transgender describes an umbrella of other gender identities including, transgender, non-binary, gender fluid and various other identities that may not align with societies common understanding of men and women. This category includes people who identify in some way differently from the sex they were assigned at birth. It is important to note that there is a limitless number of possible gender identities and that these are the categories I will use for this research. There is not much research on the inclusion, or lack thereof, of transgender students in high school classes making it important to consider research on cisgender females and extend that to this other marginalized gender identities.

The other category of students included in this research are those who have marginalized identities of sexual orientations. Sexual orientations considered marginalized are any that are not the heterosexual normative identities. The most commonly recognized of these orientations are gay, lesbian, and bisexual, however it is important to note that this is not an exhaustive list. Since people with marginalized sexual orientations and transgender identities have often shared common struggles and experiences, it is common to use the term LGBTQ (or similar variations

including LGBTQ+ and LGBTQIA) to refer to individuals of this community. Here, Q represents queer, which is an umbrella term that individuals of the community have proudly reclaimed as a positive word to refer to variety of identities that exist in this community. Therefore, the identities I will focus on for this research includes all individuals who identify as cisgender females or members of the LGBTQ community.

### **Existing Research Regarding Cisgender Females**

For many years, cisgender female students have been considered to lag behind their male peers in terms of achievement in STEM disciplines. This is an area that has been extensively studied so it is important to first understand what has been researched in terms of gender as a binary and success in secondary mathematics, and then consider applying this to students of all genders and sexual orientations in our classrooms.

Research in recent years has consistently shown that girls complete high school STEM classes at about the same rate as boys and earn approximately the same grades (Halpern et al. 2007). This is a great improvement compared to the latter part of the 20th century. The difference between academic performance based on gender now is noticeable on high-stakes assessments and completion of collegiate level STEM work. For example, it has been shown that the SAT college readiness test underestimates females potential for success in college level mathematics as compared to its estimation of their male counterparts (Halpern et al. 2007). Women also represent less than one-third of doctoral candidates in chemistry, computer science, mathematics, physics, and engineering even though they earn about 45% of total doctoral degrees (Halpern et al. 2007). Similarly, while women comprise around half the nation's workforce in the 21st century, they make up only 26% of the workforce in engineering and science (Halpern et al. 2007). If we are to believe that women have the same mathematics

potential as male students, we have to acknowledge that societal attitudes, beliefs, and expectations may be the thing that is discouraging females from pursuing these careers or doubting their abilities in these fields (Halpern et al. 2007).

In order to understand why the issue of a gender gap in mathematics tests and college enrollment is an important topic that has persisted for more than 50 years, we must take a step back to examine how our society has defined what is “normal” in various spaces. It is important to note that classes, curricula, and educational institutions have historically been created by white males, for white males. This especially influences the way STEM classes are set up (Skelton et al. 2006). While we have now invited students of various identities into our mathematics classrooms, little has been done to modify the classroom environment to better serve diverse student populations. Instead, we view male students and their performance as the “norm” and anything that is different than that as problematic (Forgasz & Rivera, 2014). This can be seen in the fact that the majority of textbooks used in schools still overwhelmingly use “he” pronouns in the examples and stories used to teach the content (Forgasz & Rivera, 2014). This serves as a subtle reminder to students that males doing mathematics is what is expected and normal. We may welcome others into these spaces but have not sought to modify these environments to better serve the diverse student populations we now serve.

These societal expectations also have an impact on how our students are socialized both in and out of classrooms. High school students internalize stereotypes and expectations both directly from individuals in their life and subconsciously as a part of larger society whether we want them to or not (Forgasz & Rivera, 2014). Students in elementary schools have been found to be aware of stereotypes about who is and who is not supposed to be interested in STEM (Halpern et al. 2007). The term “stereotype threat” is used to describe situations when

individuals of a stereotyped group underperform because of the stress and pressure they feel from society's expectations of their abilities, or lack thereof (Halpern et al. 2007). Girls, specifically cisgender girls, learn in elementary school that it is not considered normal for them to be interested in mathematics (Halpern et al. 2007); this belief stays with them into high school and college. It is no wonder that this would have an effect on how girls view themselves and their level of performance in high school mathematics classes. Because of this, cisgender girls who are interested in mathematics have to reckon with the fact that they are "different" than other girls (Skelton et al. 2006). This shows us that while some may say that the gender gap among females is gone, it still remains in some ways.

### **Understanding LGBTQ Students**

Research suggests that the gender gap and inclusion of cisgender girls in high school and college mathematics classes has improved since the latter parts of the 20th century however students who identify outside of "boy" or "girl" have often not been included in this research. Students of the LGBTQ community not only have fewer connections and attachments within school environments but are also at a much higher risk for depression and suicide ideation than peers not a part of this community (Pearson et al. 2007). Twenty-five percent of all high school students report hearing teachers make negative remarks about a student's gender expression (Greytak et al. 2016). Almost 18% of LGBTQ high school students report missing one or more days of school in the past month due to feeling unsafe at school (Greytak et al. 2016). A growing percentage of our students are identifying under the LGBTQ umbrella, but little is being done to educate teachers on how to better support and teach these students.

Even here in Iowa, our LGBTQ students are facing barriers in school that get in the way of their learning. Forty-four percent of transgender students here in Iowa have been forbidden

from using their personal pronoun that most closely aligns with their identity and 59% of students have experienced some form of discrimination in relation to their LGBTQ identity (GLSEN, 2019). LGBTQ students are clearly facing barriers related to who they are that get in the way of their education.

We know that LGBTQ students are less likely to complete Algebra 2 (Whipple K., n.d.) than their cisgender peers. Since Algebra 2 is a prerequisite for many postsecondary degree programs, not completing Algebra 2 limits LGBTQ students' options after high school. Knowing that both cisgender female and LGBTQ students face more problems with self-confidence and self-esteem in general, it is no surprise that they are uneasy about their mathematics classes. This unease is heightened since mathematics classes are viewed as more demanding and having less supportive classroom environments than other high school classes (Pearson et al. 2007). The fact that these students are intimidated by STEM classes is not their fault or about their academic competence, but a fault in our education system and classroom culture. We should never expect all of our students to pursue STEM careers, however, mathematics is needed in many careers and by adults in the modern world. When students, more frequently cisgender females and LGBTQ students do not take advanced mathematics classes, their post high school opportunities are immediately limited. It is very important for our students to see the importance of mathematics because, "More mathematics means more choices. Mathematics can make a difference in your life" (Jacobs et al. 2001, p. 46). We need to be empowering all of our students to have access to these pathways for their futures.

### **Inclusivity Problems in the Mathematics Classroom Environment**

The other reason I found this topic to be important is that high school mathematics teachers are found to be the least likely to exhibit some form of LGBTQ inclusive practices when

compared with all other secondary subject teachers, 36.3% versus 53.6% for teachers overall (Greytak et al. 2016). This shows we, as mathematics educators, need to do better. If we are to believe that STEM is an important area of study for our students, then we need to be intentional about setting up our mathematics classrooms in a way that promotes success for all students.

In order to truly improve and support students of diverse identities, females and LGBTQ students need to feel welcome and that they belong in the class, especially considering we know that students are likely to view these courses as male dominated. An example of how these classrooms may further perpetuate this stereotype, is that some texts may only use stereotypical white male names in examples. The use of textbooks where this is the case, directly reinforces the belief that males are the ones expected to do mathematics. This is one example of how classrooms can further perpetuate stereotypes.

Teachers may also reinforce stereotypes in their classroom unintentionally. Studies have shown that boys receive more praise from teachers in mathematics classrooms and that this praise tends to be enthusiastic and focused on their innate intelligence (Skelton et al. 2006). Girls are more likely to receive praise that is directed at their hard work (Forgasz & Rivera, 2014). This may not seem like a big deal but it is a message students notice and internalize, further perpetuating the myth that boys are better in mathematics compared to students of other genders and identities. Research has shown that girls report lower levels of self-confidence in mathematics than boys (Jacobs et al. 2001). This self-confidence in turn affects the willingness students have to take future mathematics classes. One of the factors that increases odds of taking higher level mathematics classes is the belief that one possesses a high level of ability in mathematics (Jacobs et al. 2001). Based on this and the fact that boys are more likely to be told that they are “good” at mathematics, it should be no surprise that boys outnumber girls in higher

levels of mathematics classes because they are the ones being told that they are more naturally talented at mathematics and that belief increases one's motivation to further their mathematics education.

One of the other facts about classrooms is that they do not exist in a vacuum and therefore are influenced by other parts of society. Students bring their experiences and beliefs into class with them and this can affect their outlook on learning. This includes the beliefs students get from their families. Children's views of mathematics are strongly impacted by the way their parents talk about their own mathematics ability, experiences, and level of importance that they place on it (Gallagher & Kaufman, 2005). Research has shown that parents are more likely to push for their son to take higher level mathematics classes versus for their daughters (Gallagher & Kaufman, 2005). This may be due, at least in part, to the fact that parents tend to overestimate their son's mathematics ability and underestimate their daughters (Gallagher & Kaufman, 2005). While this research only focuses on cisgender boys and girls, based off of the trends we have seen it seems logical that transgender or non-binary children would also be underestimated in abilities, similar to cisgender females. Knowing this, it will be important for us to work to educate society as a whole on how they talk about mathematics and how that affects others. Most parents would never intentionally pass on negative beliefs or attitudes to their children and are simply unaware of how their words and actions are affecting their children. In order to really set our children up for a life of self-confidence and academic success, we must all challenge the stereotypes and expectations that have shaped our current world and help students' parents to see how they talk about mathematics influences their children. While these conversations may not happen in classrooms, it is important to note that they still influence our classrooms and students.

### **Problems in Mathematics Curriculum and Pedagogy**

High school mathematics teachers have been found to be the least likely of all secondary teachers to consider LGBTQ issues when selecting curriculum and planning lessons (Greytak et al. 2016). Even more concerning, is the fact that only 12% of mathematics teachers report having supported LGBTQ students one on one compared to 28% of all secondary teachers (Greytak et al. 2016). This shows that mathematics teachers are lagging behind other educators in terms of inclusive practice and should seek to improve.

One approach that teachers can use to improve their pedagogy is by promoting gender-complex education. This means, “directly acknowledging gender diversity by making our curriculum and pedagogy reflect the existence of transgender and gender nonconforming people” (Rubel, 2016, p. 436). This can be implemented directly by using problems that model real gender issues or more subtly by not using materials that promote the idea of gender only being a binary or those that reinforce gender stereotypes. An example of how this can be implemented is shown in the basic algebra problem I created: “*There are 24 students in the classroom. There are 6 more girls than boys. How many boys are in the class?*” This problem blatantly ignores the possible existence of anyone other than a “boy” or a “girl” being in this class and reinforces the belief that anyone who identifies outside of these two categories is not considered normal or expected. However, teachers can modify problems so students practice the same mathematics content, while not using “boy” and “girl” as the two categories. For example, “*There are 24 students in the classroom. They divide into two groups: those who are at least 5 feet tall and those who are under 5 feet tall. There are 6 more people who are at least 5 feet tall than those that are under. How many students are under 5 feet tall?*” This problem is solved the same way as the previous one but is just using a different characteristic that includes all students. This is



just one of the many ways this problem, and other problems, could be adapted to still use the same mathematics, while using a more inclusive context.

Also, it is important to create a physical environment that is clearly affirming of various identities. Allowing students to share pronouns, chosen names, or other personal information in an environment that is respectful and compliant towards these wishes can go a long way (Collins & Ehrenhalt, 2018). These things show students that the teacher is not making assumptions about any of the students and is aware of issues that may affect various identities. Even just knowing that adult allies exist, can help LGBTQ students develop a positive sense of self and cope with bias when it is encountered (Biegel, 2018). If our students feel positive about themselves and the environment that they are in, that will help to support growth in academic achievement.

Knowing that there are problems facing our female and LGBTQ students in mathematics classes, it is important to seek to change our classroom environments to better support all students. Even simply acknowledging that stereotype threat is a thing and can impact how students perform on assessments, can help students to acknowledge when this is happening and begin to combat it (Ngoma, n.d.). Research has shown that even just telling students that the test does not show a difference in scores between genders can increase the scores of female students (Gallagher & Kaufman, 2005). While the research on this phenomenon has been focused on females, it makes sense that this same effect would happen with LGBTQ students since similar results have also been found to be true with race and other marginalized identities.

One of the other actions teachers can take to support female and LGBTQ students success in mathematics is by promoting a growth mindset. We know that female students report lower self confidence in their mathematics abilities (Jacobs et al. 2001) and that LGBTQ students struggle in a similar way, as they are less likely to complete Algebra 2 (Whipple, n.d.). Research

has shown that a growth mindset has the potential to increase female students' mathematics learning (Degol et al. 2017). Growth mindset has actually been shown to increase academic performance in all students and middle school students who have a growth mindset regarding mathematics are more likely to take advanced mathematics courses in the future (Degol et al. 2017). This means if we can support all of students, regardless of identities in gender or sexual orientation, achieve a growth mindset in middle school we could see increased success and participation in STEM from these students. Exposing students to ideas about growth mindset and how our brains grow and change, can help them to overcome the negative messages or beliefs about their abilities they have heard in the past and find value in perseverance to achieve at a higher level.

It is also important to use real world examples to model the mathematics content being taught. LGBTQ and gender issues are just one of the many real topics that can be modeled with math. While the specific topics that may be appropriate will depend on the specific content, learning goal, and community you are teaching in, by integrating examples that seek to explain real problems your community or students are facing, you not only help bring awareness to the specific topic but also show mathematics is relevant in the world outside of school. This also can help get students to “buy in” to the content since they see the relevance of it. The easiest subject to integrate real situations into is often believed to be statistics but it can be successfully done in any class. Topics like exponentials, linear models, or proportions can be applied to real situations that your students may be impacted by.

These actions can be the start of changing how our students of marginalized identities experience school and education. Research has shown that with issues of inclusion and affirmation of diverse students, top-down efforts are least effective (Biegel, 2018). This means

that not only does what we do as educators matter, but that individual teachers will be the ones who change our school climate. Our jobs will always be focused on teaching our content but how our students feel in our classroom will have a strong impact on how well they are able to learn that content. The focus on helping students learn the content applies to all of our students. Our schools are what shapes the future society and workforce and if we want to set up our society for a strong future, we need to encourage all of our students to be the best and most knowledgeable versions of themselves. DeWitt (2012) puts it best, “An inclusive school that promotes a safe climate is not catering to LGBTQ students. It is actually allowing all students to feel welcome” (p. 41).

### **Findings**

Put simply, our schools, teachers, and society still have a long way to go to achieve equity for students regardless of their gender and sexual orientation. Looking at the research, it is clear that we have made great progress for our female students in STEM fields. The test scores and rates of participation in high school mathematics classes among females is equal or just slightly below those of their male peers. However, when we consider higher education, we find the level of female participation decreasing as education and degree level increases (Halpern et al. 2007). Students continue to identify mathematics as a male domain and it seems as if some students are impacted by this stereotype threat. If we want to “close” the gender gap in mathematics, we need to intentionally expose students to diverse role models in the field, remind students that mathematics ability exists in all people and is not fixed, and use curricula that are inclusive and representative of our students’ experiences and lives. These actions will serve to counter messages society is sending to young students that mathematics is a field for males. Progress has been made in showing that some females can do math, but to truly combat the

negative effects that stereotypes have, we need to continue to work to normalize female and non-binary participation in mathematics at all levels of education.

Although many are talking about the gender gap in terms of the male and female dichotomy, we also need to broaden this discussion to include our LGBTQ students. Students in this community face tremendous struggles in their personal lives that impacts their abilities to succeed in school. LGBTQ adolescents are far more likely to have suicidal thoughts, feel unsafe at school, and opt out of taking advanced mathematics courses (Pearson et al. 2007). In addition to this, research has shown that secondary mathematics teachers do the worst at supporting LGBTQ students when compared to all other subject area teachers (Greytak et al. 2016). This means we, mathematics educators, have a lot of work to do. Simply the act of identifying yourself as a supportive and affirming adult can make a big difference in the life of an LGBTQ young person and improve their performance in mathematics class. This can mean having visual signs of support for the community in your classroom, using inclusive curriculum and examples, and intervening in acts of bias. If our students feel more supported and comfortable in school spaces, they will be able to succeed in mathematics classes and open the doors thought to only be available to their heterosexual male counterparts, after high school.

### **Conclusion**

Looking at all of the information and research question 1, it is clear we need to do more to support students of marginalized gender identities. There is little research specifically on transgender or non-binary students, however we can draw some conclusions from the research on female students. Lots of improvement has been made as far as supporting our female students in mathematics, however stereotypes of mathematics being a male domain still remain and this affects both our female and transgender students. However, educating students on stereotype

threat, exposing students to diverse role models, and limiting examples that play on stereotypes, can help students to achieve a growth mindset and be successful.

When looking at research question 2, the results are similar to question 1. Having a visual sign of support for the LGBTQ community and intervening when acts of bias are observed, can help LGBTQ succeed in a safe and supportive environment. It is also important to run a classroom that expects to have diversity in sexual orientation identities and family structures. This can mean using inclusive language and not referring to gender as only “boys” and “girls.”

There is never going to be one perfect solution or teaching strategy for a specific identity because our students will always be individuals who have unique personalities and learning needs. However, it does not harm any student to set up an inclusive environment. Creating a space for diverse identities to coexist not only supports students of those identities but brings awareness of the need for diversity and acceptance to everyone.

This research has given me a lot to think about for my future teaching of secondary mathematics. I want my classroom to be a place where all my students feel supported, heard, and know they have the capability to be a mathematical thinker. Little things like recognizing diverse individuals who have contributed to the field throughout history can do a lot to counter stereotypes and the negative effects that they can have on student learning of mathematics. I am also excited to display my “Safe Zone Ally” placard I earned at UNI to serve as a visual sign of support for all of my students who may identify with this community. I also know that it will be important for me to expose my students to the ideas of growth mindset to help remedy the negative talk they have heard about mathematics in the past. Our students all have unique needs and it is our job as educators to teach them all. It is so important that we all affirm students for who they are, not who we think they should be, which can be especially true for female and

LGBT students who are often not expected to succeed in mathematics class. It is also important for educators to first be aware of their stereotypes and preconceived expectations of students so that they can work to lessen the effects of them. Teachers are there to support all students and part of being able to do that effectively is first being able to identify what stereotypes they may hold. It is also important to remember that our actions need to match our words. Following through means challenging others, learning proper terminology, using inclusive language and curriculum, and always being willing to learn and listen. None of us are perfect but learning and seeking to improve is the first step.

## References

- Biegel, S. (2018). *The right to be out: Sexual orientation and gender identity in America's public schools*. University of Minnesota Press.
- Collins, C., & Ehrenhalt, J. (2018). *Best practices for serving LGBTQ students*. Teaching Tolerance. <https://www.tolerance.org/magazine/publications/best-practices-for-serving-LGBTQ-students>
- DeWitt, P. M. (2012). *Dignity for all: Safeguarding LGBTQ students*. Corwin Press.
- Degol, J. L., Wang, M.-T., Zhang, Y., & Allerton, J. (2017). Do growth mindsets in math benefit females? Identifying pathways between gender, mindset, and motivation. *Journal of youth and adolescence*, 47(5), 976–990. doi: 10.1007/s10964-017-0739-8
- Forgasz, H., & Rivera, F. (2014). *Towards equity in mathematics education*. Springer Berlin.
- Gallagher, A. M., & Kaufman, J. C. (2005). *Gender differences in mathematics: An integrative psychological approach*. Cambridge University Press.
- Gender Identity Terminology*. (n.d.). University of Northern Iowa. Retrieved October 23, 2019, from <https://LGBTQ.uni.edu/gender-identities>.
- GLSEN. (2019). *School Climate in Iowa (State Snapshot)*. GLSEN.
- Greytak, E.A., Kosciw, J.G., Villenas, C. & Giga, N.M. (2016). *From teasing to torment: School climate revisited, a survey of U.S. secondary school students and teachers*. GLSEN.
- Halpern, D., Aronson, J., Reimer, N., Simpkins, S., Star, J., and Wentzel, K. (2007). *Encouraging Girls in Math and Science (NCER 2007-2003)*. Washington, DC:

*National Center for Education Research, Institute of Education Sciences, U.S. Department of Education.* <http://ncer.ed.gov>.

Jacobs, J. E., Becker, J. R., & Gilmer, G. F. (2001). *Changing the faces of mathematics: Perspectives on gender*. NCTM.

Merriam Webster Co. (n.d.). *Inclusive*. Retrieved October 23, 2019, from <https://www.merriam-webster.com/dictionary/inclusive>.

Ngoma, H. (n.d.). *How teachers can reduce stereotype threat in the classroom*. Rutgers. <https://cesp.rutgers.edu/blog/how-teachers-can-reduce-stereotype-threat-classroom>

Pearson, J., Muller, C., & Wilkinson, L. (2007). Adolescent same-sex attraction and academic outcomes: The role of school attachment and engagement. *Social Problems*, 54(4), 523–542. doi: 10.1525/sp.2007.54.4.523

Rubel, L. H. (2016). Speaking up and speaking out about gender in mathematics. *The mathematics teacher*, 109(6), 434–439. doi: 10.5951/mathteacher.109.6.0434

Skelton, C., Francis, B., & Smulyan, L. (2006). *The sage handbook of gender and education*. SAGE Publications.

Whipple, K. (n.d.). *How do we make math class more inclusive of trans and non-binary identities*. GLSEN. <https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities>