Spring 2022

“Jus I Learn Differently”: The Experiences of Dis/abled Students of Color Interpreting and Resisting Normalizing Forces in the Mathematics Classroom

Dina Mahmood
Chapman University, dmahmood@chapman.edu

Follow this and additional works at: https://digitalcommons.chapman.edu/education_dissertations

Part of the Disability and Equity in Education Commons, and the Science and Mathematics Education Commons

Recommended Citation

This Dissertation is brought to you for free and open access by the Dissertations and Theses at Chapman University Digital Commons. It has been accepted for inclusion in Education (PhD) Dissertations by an authorized administrator of Chapman University Digital Commons. For more information, please contact laughtin@chapman.edu.
“I Just Learn Differently”: The Experiences of Dis/abled Students of Color Interpretating and Resisting Normalizing Forces in the Mathematics Classroom

A Dissertation by

Dina Abbas Mahmood

Chapman University
Orange, CA
Attallah College of Educational Studies

Submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Educational Studies

May 2022

Committee in charge:
Kris T. De Pedro, Ph. D., Chair
Cathery Yeh, Ph.D., Co-Chair
Brian R. Lawler, Ph. D.
The dissertation of Dina Abbas Mahmood is approved.

Kris T. De Pedro, Ph.D., Chair

Cathery Yeh, Ph.D., Co-Chair

Brian R. Lawler, Ph.D.

April 2022
“I Just Learn Differently”: The Experiences of Dis/abled Students of Color Interpreting and Resisting Normalizing Forces in the Mathematics Classroom

Copyright © 2022

by Dina Abbas Mahmood
ACKNOWLEDGEMENTS

First, I would like to acknowledge the incredible privilege I have in being able to pursue a doctoral degree. I want to thank all of those who have supported me in this journey.

I would first like to thank my doctoral committee: Cathery, Kris, and Brian. Thank you for all your feedback, advice, time meeting, and reading through my drafts! Cathery, working with you the past few years on equity in mathematics has been a true gift and has catalyzed tremendous growth in my practice as a mathematics educator. I am indebted to you for the opportunities and knowledge I have attained working alongside you.

I would also like to acknowledge my students and colleagues. As a mathematics educator, I have failed many times to be an equitable and just educator. I am grateful for my students who have challenged, supported, and sat with me as I have experimented and struggled in my growth as an educator. Thank you to my colleagues who have pushed and challenged me to sharpen my perspective on education and schooling. To my school administrators, thank you for all your support over the past years as I have completed this doctoral journey. To Christian, you inspired me to start this journey and kept me going when I thought I couldn’t. Thank you.

To Sabrin, thank you for always checking in on me and for being my first practice participant in this study! I know you always got me.

To my mother and father, who kept pushing me to keep pushing. Thank you for all your love, support, and patience with me. The personal sacrifices you made in your lives to ensure the happiness of your children push me to strive higher every day.

Finally, to Hugo, Alma, and Zaha, thank you for reminding me that there is more to life than sitting alone at my desk and giving me the time and energy to finish this journey. This is all for you.
ABSTRACT

“I Just Learn Differently”: The Experiences of Dis/abled Students of Color Interpreting and Resisting Normalizing Forces in the Mathematics Classroom

by Dina Abbas Mahmood

This critical phenomenological study employs a disabilities studies in education and critical race theory (DisCrit) lens to unpack the learning experiences of seven dis/abled students of color in the secondary mathematics classroom. Based on data collected from individual and group interviews, the counter-stories presented in this study highlight the implicit and explicit ways that the normative forces of ableism and racism circulate in the secondary mathematics classroom. Through their education journey maps, the participants described forms of hyper-labeling, experiences of implicit and explicit biases from teachers and peers, and rigid conceptions of mathematics that constrained their success. The counter-stories are, more importantly, stories of resilience and resistance as participants successfully navigated the normalizing forces of racism and ableism in secondary mathematics education and eventually pursued learning in higher education.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ........................................................................................................ iv

ABSTRACT ........................................................................................................................... v

LIST OF TABLES ................................................................................................................... x

LIST OF FIGURES ............................................................................................................... xi

LIST OF ABBREVIATIONS ................................................................................................. xii

CHAPTER 1: INTRODUCTION .............................................................................................. 1
  Current Research .............................................................................................................. 3
  Definitions of Terms ......................................................................................................... 6
  Statement of the Problem and Purpose of the Study ...................................................... 11
  Significance of the Study ................................................................................................. 12
  Research Questions ......................................................................................................... 13

CHAPTER 2: LITERATURE REVIEW ...................................................................................... 14
  DisCrit Theoretical Framework ...................................................................................... 14
  Pedagogy of Pathologization .......................................................................................... 16
    Hyper-Labeling ............................................................................................................ 16
    Hyper-Surveilling ......................................................................................................... 21
    Hyper-Punishment ........................................................................................................ 27
  Reframing Student Mis/behavior as Resistance ............................................................... 34
  Gaps in the Literature ..................................................................................................... 37
    Over-Reliance on Quantitative Methods .................................................................... 38
    Addressing the Multidimensional Identities of Students ........................................... 38
    A Lack of Student Voices and Experiences ................................................................. 39
  Purpose of This Study .................................................................................................... 40

CHAPTER 3: METHODS ..................................................................................................... 43
  Methodological Approaches .......................................................................................... 44
    DisCrit .......................................................................................................................... 44
    Phenomenology .......................................................................................................... 47
    Critical Phenomenology .............................................................................................. 48
    Ethical Framework ...................................................................................................... 50
    Theory as Activism ...................................................................................................... 50
    Culturally Responsive Methodologies ....................................................................... 52
  Researcher Positionality ................................................................................................. 54
    Learning Mathematics as a Nondis/abled Student ...................................................... 54
    Learning Mathematics as an Iraqi American, Muslim American Student .............. 55
    Learning Mathematics as a Teacher ........................................................................... 56
    Learning Mathematics as a Researcher ....................................................................... 59
    Social Locations .......................................................................................................... 61
CHAPTER 4: RESULTS ......................................................................................................................... 96

Counter-stories ................................................................................................................................. 96

BB ................................................................................................................................................ 97

Embracing a Student Centered Approach to Learning: “Math is Magical.” .................................. 98
Strategically Advocating for Her Access Needs: “It’s an Inconvenience to Me Too.” .................. 100
Paternalistic Methods of Teaching: “I Had to Pretend to I Was Doing It the Way the Teacher Showed.” ....................................................................................................................... 101
Ableist Conceptions of Being and Knowing: “But, Your Score Doesn’t Count Because You Get Extra Time.” .................................................................................................................. 102
Compounding Marginalization of Racism and Ableism: “It Exacerbates the Feeling That I Don’t Belong Here, and With Autism, That Was Already a Thing.” .................................................. 105

MJ ...................................................................................................................................................... 107

Narrow Conceptions of Mathematical Ability: “I’m Just Going to Fail Regardless.” ................... 108
Confronting Societal Expectations: “My Life Shouldn’t be Miserable.” ........................................ 109
An Intractable Problem to be Discarded: “They Didn’t Try to Change the Way They Taught It.” ........................................................................................................................................... 111
A Culture of Exclusion: “There Was No Way to Make It More Relatable to Them.” ................ 111
Remediating the Student Rather Than the Learning Environment: “I Just Learn Differently.” ............................................................................................................................................ 112

Ariel .................................................................................................................................................... 114

Privileging Speed, Memorization, and the Teacher’s Ways of Knowing ...................................... 115
Challenging Low Expectations: “She Knew Something Was Wrong.” ......................................... 117
Disruptive Positioning: “It Felt Good Because I Was Able to Share How I Did It.” ................... 118
A Dysfunctional Ecology: “They Would Look at You.” ................................................................. 119

Kirby .................................................................................................................................................. 121
Resisting Subjugation: “Done With people.” ................................................................. 122
Double Jeopardy: “I Was Already the Black Sheep.” ................................................. 125
Carina ............................................................................................................................ 127
Was Stupid and Who Wasn’t.” .................................................................................. 128
Tensions Between Self and Context: “That’s All on Me. I Can’t Blame Anyone Else” 131
Rigid Conceptions of Learning: “We Had to Show Work” ........................................ 133
Interconnections of Contradictory Dominant Ideologies: “Am I Actually Smart?” ...... 134
Dewey .......................................................................................................................... 137
Confronting the Boundaries of Learning: “Grade School Was so Cookie-Cutter” ...... 137
Whiteness and Ability as Property: “If It Wasn’t for Her, Maybe I Wouldn’t be at the
Math Level I Was in.” ............................................................................................... 140
Notions of Normalcy: “Everything in This World is Tuned to Whatever Normal Means.”
................................................................................................................................. 141
James ............................................................................................................................ 144
Disrupting Presumptions of Deficiency: “I’m a Big Concept Person.” ...................... 144
Problematising the Environment Rather Than the Student: “I Was Given the Proper Tools
to Succeed.” ............................................................................................................. 146
Problematising the Authority of Teachers: “At the Mercy of the Adults” ................. 148
Being Seen: “I Identify as Me and the Experiences That I’ve Had.” ......................... 149
A Cross-Case Analysis ............................................................................................... 151
Research Question 1: How Do Dis/abled Students of Color Interpret Being Raced and
Dis/abled in the Mathematics Learning Environment? ............................................. 152
Hyper-Labelling: “The Other” .................................................................................... 152
Implicit and Explicit Bias ........................................................................................... 156
Rigid Conceptions of Mathematical Learning .......................................................... 158
Research Question 2: How Do Dis/abled Students of Color Resist the Normalizing Process of
Racism and Ableism in the Mathematics Classroom? ............................................ 161
Self-Defeating Resistance ......................................................................................... 161
Conformist Resistance .............................................................................................. 165
Transformative Resistance ......................................................................................... 166
Conclusion .................................................................................................................. 170

CHAPTER 5: DISCUSSION ............................................................................................. 171
DisCrit and Equity in Mathematics Education .......................................................... 171
Interdependence of Racism and Ableism in the Mathematics Classroom .............. 171
Multidimensional Identities of Dis/abled Students of Color ..................................... 174
Impacts of Being Labelled as Raced or Disabled in the Mathematics Classroom .... 177
Connections to Broader Context .............................................................................. 181
Implications for Mathematics Practitioners ............................................................. 183
Implications on Research Methodology ................................................................... 186
Centering the Voices of the Multiply Marginalized ................................................... 186
Virtual Data Collection .............................................................................................. 188
Future Research ........................................................................................................ 189
Participants ................................................................................................................. 189
Collaborative Learning ................................................................. 190
Teacher Education and Professional Development ....................... 191
Limitations .................................................................................. 192
Final Thoughts ............................................................................ 193

References .................................................................................... 195

Appendices .................................................................................... 213
LIST OF TABLES

Table 1  DisCrit Informed Research Design.................................................................46
Table 2  Participants’ Demographics.................................................................................66
Table 3  Participants’ Interview Dates.................................................................................68
Table 4  Sample Transcript Editing Into Anecdote ..........................................................87
Table 5  Descriptive Codes...............................................................................................88
Table 6  Sentence by Sentence Thematic Analysis ...........................................................90
LIST OF FIGURES

Figure 1. Data Collection Timeline ..............................................................................................64
Figure 2. Mahmood’s Personal Education Journey Map.................................................................70
Figure 3. Sample EJM With Comments From Participants..............................................................76
Figure 4. Jamboard With Comments From Participants.................................................................81
Figure 5. Thematic Analysis Process............................................................................................89
Figure 6. BB’s Education Journey Map........................................................................................99
Figure 7. MJ’s Education Journey Map......................................................................................109
Figure 8. Ariel’s Education Journey Map...................................................................................116
Figure 9. Kirby’s Education Journey Map..................................................................................122
Figure 10. Carina’s Education Journey Map ..............................................................................129
Figure 11. Dewey’s Education Journey Map...............................................................................138
Figure 12. James’s Education Journey Map................................................................................147
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>DisCrit</td>
<td>Disabilities Studies and Critical Race Theory</td>
</tr>
<tr>
<td>IEP</td>
<td>Individualized Education Plan</td>
</tr>
<tr>
<td>EJM</td>
<td>Education Journey Map</td>
</tr>
<tr>
<td>CRM</td>
<td>Culturally Responsive Methodology</td>
</tr>
<tr>
<td>DSME</td>
<td>Disabilities Studies and Mathematics Education</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

Mathematics education in the United States acts as a gatekeeper to traditional measures of success for students. To graduate high school with a diploma, access higher education, and pursue a high paying career predominantly in the fields of science and mathematics, students must be successful in their mathematics classes (National Mathematics Advisory Panel, 2008; Shapka et al., 2007; U.S. Department of Education, 2008). Given the importance of mathematical learning, there has been a renewed effort in mathematics education to increase equity and access to rigorous mathematical experiences for all learners by addressing issues of race, class, culture, language, and gender (National Council of Supervisors of Mathematics & TODOS: Mathematics for ALL, 2016). However, these renewed efforts in mathematics education have failed to address the persistent inequities for dis/abled students (Borgioli, 2008; Lambert et al., 2018; Tan & Katsberg, 2017). Furthermore, there is a need to attend to the issues that face the needs of those who live within the intersections of oppression, the multiply oppressed (Annamma et al., 2016), such as dis/abled students of color (Annamma et al., 2016) in education.

Race must be considered in research on dis/abled students; anything else would be irresponsible (Annamma et al., 2016). Students of color, students living in poverty, students who have been identified as needing special education resources, and English language learners are more likely than their White, middle-class, English-speaking peers to be denied access to experienced teachers, challenging mathematics courses, and, within the classroom, high expectations from their teachers (Esmonde, 2017a). Black students and other students of color are more likely than their White counterparts to be placed in restrictive special education placements, isolating them from a more rigorous curriculum than in the general education
classroom (Annamma et al., 2016; Blanchett, 2006; Klinger et al., 2005). Furthermore, African American and Latinx students who receive special education are less likely than their nondisabled counterparts to earn a college preparatory diploma (Tabron & Ramlackhan, 2019) and are more likely to be suspended or expelled (U.S. Department of Education Office for Civil Rights, 2016). Dis/abled students of color have become the "outflows in dysfunctional education ecologies . . . imagined as intractable problems to be discarded" (Annamma et al., 2020, p. 116). Those who do not fit the normative standards of success and achievement are compelled to change or be forced out of the educational system. Success in mathematics distinguishes between the white, male, non-dis/abled and those who fall outside the norm. The “mathematics for all” movement in mathematics education embodies a cultural and historical belief in the role of mathematics to develop a common value system and the citizenry that values particular norms. All students must reach those values or be considered a deficit to society (Yolcu & Popkewitz, 2019).

Through this study, I sought to reposition dis/abled students of color as knowledge generators whose counter-stories can challenge the dominant narratives of smartness, ability, and resistance in the mathematics classroom. As mathematics researchers and educators work to reimagine equity in mathematics education for students, studies centering on the voices and experiences of students are still emerging, particularly studies that highlight the ways dis/abled students of color navigate, subvert, or resist the educational system that positions them as less than.

By highlighting the lived experiences of dis/abled students of color and how students challenge a mathematical learning environment that perpetuates racism and ableism, I hoped to unmask and expose the normative processes for race and disable students in the mathematics
classroom. This study contributes to the urgent call by critical scholars and practitioners to eliminate the practice of denying access and opportunities to learning for students who do not conform to or meet the normative standards of White smartness and behaviors (Annamma, 2018).

Using disabilities studies in education and critical race theory (DisCrit) as a guiding theoretical framework, this critical phenomenological study:

- Investigated the lived experiences of dis/abled students of color as they learn mathematics in the public school secondary education setting,
- Unmasked and exposed the normative processes that race and disable students in the mathematics classroom,
- Illuminated how dis/abled students of color resist those normative processes of racism and ableism in the mathematics classroom, and
- Contributed to researchers' and practitioners' reconceptualization of equity in mathematics education by identifying factors that support dis/abled students of color in the mathematics classroom.

**Current Research**

Research on supporting dis/abled students in mathematics education has been limited, emerging, and often relegated to the field of special education (Borgioli, 2008; Lambert et al., 2018; Tan & Katsberg, 2017). Special education research and practices continue to operate with a positivist and pathological view of disability where efforts are focused on fixing the student rather than fixing the system that works to disable the student (e.g., Annamma et al., 2016; Borgioli, 2008; Collins, 2013; Greenstein & Baglieri, 2018). In mathematics education, efforts to support students in special education focus on remediating the students' identified deficits, such
as through rote memorization of procedural steps instead of emphasizing conceptual understanding. Curriculum, instruction, or classroom interactions are rarely examined as needing remediation (Tan & Katsberg, 2017; Lambert, 2015; Collins, 2013). Identifying the disability within the child, when the disability is a social construct, benefits the school because it excuses the school's responsibility for changing (Tan & Thorius, 2019). Furthermore, the system of special education keeps students disabled through: "segregation, low expectations, failure to provide accommodations, misguided attempts to 'cure' the disability, the focus on 'dominant' [sic] rather than 'critical' [sic] mathematics and treating differences as problematic rather than embracing diversity" (Hehir, 2005 as cited by Borgioli, 2008, p. 140).

Emerging efforts to use disabilities studies education alongside equity in mathematics education (DSME) reframes the "problem" of mathematics education for dis/abled students not as located within the individual student but rather located in the context and environment of the student's mathematical learning environment (Borgoli, 2008; Lambert et al., 2018). DSME scholars have documented how school systems continue to segregate dis/abled students from their general education peers, denying them access to rigorous learning opportunities and high-quality mathematics educators (i.e., Baglieri, 2016; Borgioli, 2008; Tan & Kastberg, 2017). They advocate addressing these inequities by assuming competence in dis/abled students, increasing opportunities to learn rigorous mathematics, increasing collaboration between mathematics education and special education, and providing more opportunities for students to be seen as mathematical thinkers and doers (Lambert & Tan, 2019).

While DSME scholars call out the need to address ableism in mathematics education, focusing on disability without consideration of race is irresponsible; ableism is a tool to support
white supremacy (Annamma, 2019). Critical race scholar Martin (2019) underlined the inadequate equity reform efforts in mathematics education:

Equity for Black learners in mathematics education is a delusion rooted in the fictions of white imaginaries, contingent on appeasing white logics and sensitivities, and characterized at best by incremental changes that do little to threaten the maintenance of racial hierarchies inside or outside of mathematics education. (p. 46)

Equity reforms in mathematics education have only maintained existing racial hierarchies rather than allow for true equity for students of color. To address ableism, we must address racism. Whereby exclusion or discrimination based on an individual's race would cause outrage in most cases, Ferri and Connor (2005) critiqued the ways that racist practices persist "under the guise of disability" (p. 454). Compared to their dis/abled White counterparts, dis/abled students of color are more likely to be labeled with a specific learning disability (NCES, 2020), more likely to be placed in restrictive settings limiting their access to general education curriculum (Cooc, 2022; Fierros & Conroy, 2002), and more likely to exit high school without a diploma (NCES, 2020).

The theoretical framework of Disability and Critical Race Theory (DisCrit), explained in more detail in chapter 2, examines the constructs of ableism and racism that work in conjunction to marginalize dis/abled students of color (Annamma et al., 2016). A sibling of critical race theory, DisCrit uncovers how educational systems justify exclusionary practices for those outside hegemonic notions of normalcy through processes such as the hyper-labeling, hyper-surveilling, and hyper-punishing of differently-abled m (Annamma, 2019). According to the DisCrit theoretical framework, "racism and ableism often work in ways that are unspoken, yet racism validates and reinforces ableism, and ableism validates and reinforces racism" (Annamma et al.,
These "interlocking structures of oppression" (Annamma et al., 2016, p. 15) intersect in such a way that (dis)ability is perceived through the lens of race. DisCrit unpacks how macro-level forms of oppression—racism and ableism—play out in micro-level experiences of dis/abled students of color, such as through teacher interactions, peer interactions, and learning experience. Students of color are differently situated than White students in the experiences of dis/abilities (Annamma et al., 2016). And nondisabled students are differently situated than dis/abled students. Dis/abled students of color experience multiple forms of oppression, and solutions that only address one aspect of their oppression or identity ultimately fail (Annamma et al., 2016). Using the lens of DisCrit contributed to this study’s rethinking equity in mathematics education for historically marginalized populations.

Definitions of Terms

Defining specialized terms used in this dissertation helps to ensure clarity and understanding. The specialized terms that are used are now explained.

Ableism

Ableism within education is a system of structures that discriminate, exclude, and oppress individuals with cognitive, emotional, and/or physical differences (Borgioli, 2008; Campbell, 2001). Campbell (2001) defined ableism as a "network of beliefs, process, and practices that produces a particular kind of self and body . . . as perfect" (p. 44). Ableism manifests in schools through educators' deficit attitude toward dis/abled students, a lack of resources to support student learning, and a system that privileges certain forms of knowledge. While biological differences do exist within individuals, these individuals should not be perceived as a deficit. Instead, these differences should be regarded as "part of the natural and beneficial cognitive diversity of society" (Lambert, 2018, p. 3).
Dis/abled Students

According to the Americans with Disabilities Act (ADA), a disability is a physical or mental impairment that substantially limits life activities. Under the Individuals with Disabilities Education Act (IDEA), there are 13 identified categories of visible and invisible disabilities such as intellectual disability, hearing impairment (i.e., deafness), a speech or language impairment, visual impairment (i.e., blindness), a serious emotional disturbance, an orthopedic impairment, autism, traumatic brain injury, and other health impairment, a specific learning disability, deaf-blindness, and multiple disabilities.

Disability is an identity to be claimed, an asset, rather than a deficit (Annamma, 2018; Berne, 2015). Using terms to hide the disabled identity, such as "person with a disability" or "differently-abled," is unnecessary. The disability with a slash (i.e., dis/ability) has been used in disabilities studies research to indicate and acknowledge the social construction of ability. The use of "dis/ability" with the slash centers the nondisabled as the main audience by reminding them that disability is a social construct. The term dis/ability has been used to reinforce what an individual can do, rather than what they cannot, and to disrupt the idea that disability is a permanent and fixed state of being without problematizing the entire context in which that individual functions (Annamma, 2013). Although I grappled with using either the term "student with a dis/ability" or "dis/abled student," I decided to use "dis/abled students" as a purposeful and intentional choice to center dis/abled students and acknowledge that being disabled is both socially constructed and a political identity (Annamma et al., 2016).

Equity

In its call for mathematic education researchers to use an equity lens in research, the National Council of Teachers of Mathematics (Gutstein, 2005) acknowledged multiple
definitions of equity. It is more important for researchers to redress the inequities that exist rather than focus on identifying a single definition of equity. This study defines equity through Gutiérrez’s Gutiérrez (2009) four dimensions of equity: access, achievement, identity, and power. Equity for students is more than closing achievement gaps on assessments. Access refers to students having resources such as high-quality educators, adequate supplies and technology, and a safe learning environment. Achievement refers to students' ability to do well on certain outcomes as measured by course-taking patterns, participation in class, test scores, and movement within the science, technology, engineering, and mathematics (STEM) career pathway. The identity aspect of equity responds to the hegemonic forces at play in schools that lead to students downplaying parts of their identities to fit. Attending to identity with an equity lens means paying attention to how students are "race, classed, or gendered" (Gutiérrez, 2009, p. 5) in the classroom and whether students can tap into their cultural practices when doing mathematics. Finally, the power dimension of equity refers to various levels of social transformation that ranges from who has a voice in the classroom to how math may be used to critique societal injustices to "rethinking the field of mathematics as a more humanistic enterprise" (Gutiérrez, 2009, p. 6) rather than fitting into a neoliberal agenda.

Inclusion

Inclusion, or inclusive education, remains a highly debated topic among educational researchers and practitioners both on its definition and its outcomes. Inclusion is part of equity-driven reform efforts and refers to the idea that all students should have access and opportunities. Practitioners often treat inclusion as synonymous with mainstreaming or desegregating. In general, full inclusion refers to the policy that dis/abled students learn alongside their general education peers for their entire education (Idol, 2006). Disabilities studies in education scholars
argue that educators teaching in inclusive classrooms must "embrace, honor, and respect differential characteristics" (Baglieri & Knopf, 2004, p. 526) of their students and that inclusive education is paramount to creating a tolerant society.

However, whether inclusion in education can achieve its goal of increasing equity for students remains a point of contention. While built on the promise of expanding educational opportunities to those individuals historically disenfranchised, inclusive education is part of an educational system that operates on "the premises of the inferiority paradigm" (Zion & Blanchett, 2011, p. 1997). In this historical legacy, researchers attempted to prove the intellectual inferiority of people of color by using White, middle-class, nondisabled men as the norm against which other groups are compared. Inclusion into the classroom remains conditional upon following "majoritarian routines with the threat of social or disciplinary sanctions for noncompliance" (Calabrese Barton & Tan, 2020, p. 2). Students are invited into the classroom as a gesture toward inclusion; yet, for authentic inclusion, the teacher must also engage in shifting classroom practices to ensure invited students are equitably accommodated (Lambert & Sugita, 2017). Otherwise, efforts for inclusion instead become the means to justify the exclusion of "non-compliant" students from certain educational opportunities (Martin et al., 2019).

**Individual Education Plan (IEP)**

Prevalent in the special education system, the Individual Education Plan (IEP) is a legally binding document that ensures that dis/abled students with an IEP have access to specified accommodations, supports, or modifications outlined in their IEP. Despite their intention to provide increased access to education for students with dis/abilities, the IEP too often becomes a tool to constrain student access (Tan, 2017a). Students must demonstrate proficiency in specific goals written in their IEPs before moving onto other goals or moving out
of the special education program. The goals tend to focus on remediating gaps in mathematical knowledge from grade levels several years behind or developing procedural fluency in calculations rather than focus on developing "powerful opportunities for students to showcase their reasoning" (Tan, 2017a, p. 31).

**Racism**

Racism is an ideology that justifies the dominance of one racial group over another. Racism upholds White supremacy through a "system of ignorance, exploitation, and power" that oppresses individuals and groups on the "basis of ethnicity, culture, mannerisms, and color" (Solorzano & Yasso, p. 24). It allows the dominant group to continue racist behavior that perpetuates their dominance and ensures that it directly benefits from racist policies and practices while negatively affecting other racial or ethnic groups (Solorzano & Yasso, 2002). It is about maintaining institutional power that people of color in the United States have never possessed.

**Special Education**

The IDEA passed in 1975 is a law in the United States designed to provide free appropriate public education in the least restrictive environment to students with an identified disability and require special education to make progress in school. The law paved the way for the formation of Special Education in the public school system in the United States. The Special Education program provides students with disabilities with legally required services and ensures public schools follow the law. Teachers within Special Education are considered to have expert knowledge in educating students with disabilities (Mahon-Reynolds & Parker, 2016). In the place of the general education teacher, the special education teacher is given the responsibility of overseeing and teaching dis/abled students.
Students of Color

The phrase "of color" refers to Black, Indigenous, Latinx, Middle Eastern, Asian American, and other non-White identities. The experiences of people of color are not monolithic; the experiences of Latinx students are different than those of Asian American students. Where possible in the study, the racial or ethnic group of the student is specifically identified to highlight the nuances and complexity in their experiences.

Statement of the Problem and Purpose of the Study

The purpose of this critical phenomenological study was to examine the lived experience of dis/abled students of color as they experienced and resisted the normative processes of racism and ableism in the secondary mathematics classrooms in the United States. By unpacking and highlighting how multiply-marginalized students strategically maneuver a mathematical learning environment that often acts as a gatekeeper, I hoped to unmask and expose the normative processes (e.g., interactions, discourse, procedures, and institutions) that uphold racism and ableism in the mathematics classroom. This study provided meaningful ways that researchers and practitioners can reimagine an equitable mathematical learning environment that honors students' strengths, identities, and humanity. In this study, dis/abled students of color were positioned not as problems to be studied but as knowledge generators working alongside the researcher (Berryman et al., 2013). The counter-stories of dis/abled students of color served as a contrast to the master narrative—that dis/abled students of color are less able and less willing to do high-level mathematics—and exposed normative practices and policies that contribute to inequities in mathematics education.

The pedagogy of pathologization that hyper-labels, hyper-surveils, and hyper-punishes dis/abled students of color continues because the normative and hegemonic processes that sustain
that pedagogy remain hidden (Annamma, 2018). This study sought to expose the interactions, discourse, institutions, and practices that perpetuate racism and ableism in the mathematical educational system.

**Significance of the Study**

Mathematics education in the United States maintains racist (Gutiérrez, 2013; Martin et al., 2012) and ableist (Borgioli, 2008; Lambert, 2018) structures. The lens of Disabilities Studies in Education and Critical Race Theory (DisCrit) can help create a more equitable learning environment in education for all students, including dis/abled students of color (Annamma & Morrison, 2018; Banks, 2017; Baglieri, 2016). By understanding the lived experiences of dis/abled students of color, this study illuminated the constraints and enablers for these students, contributing to the research on equity in mathematics and education overall. Addressing the needs of those who live within the intersections of oppression, the multiply oppressed, as Annamma et al. (2016) termed it, will also work to uplift the lives of those who are "singularly disadvantaged" (Crenshaw, 1991, p. 167). Working to address the needs of dis/abled students of color was not too narrow but instead also addressed the needs of all students.

This critical phenomenological study contributed to efforts to dismantle the role of education in upholding White supremacy by countering narratives that pathologize difference. Using a semi-structured interview protocol to collect data from seven self-identified dis/abled students of color, this study analyzed how participants described their experiences learning mathematics in secondary education. Their experiences were presented in single case analysis through compiled counter-stories (Solórzano & Yasso, 2002) and through cross-case thematic analysis (Van Manen, 1990). The final chapter of this study addresses implications for future research and for mathematics practitioners.
Research Questions

This study aimed to address the following research questions:

1. How do dis/abled students of color interpret being raced and disabled in the mathematics learning environment?

2. How do dis/abled students of color resist the normalizing process of racism and ableism in the mathematics classroom?
CHAPTER 2: LITERATURE REVIEW

This chapter reviews the current literature on mathematics education for dis/abled students of color. It includes studies compiled from the fields of special education and mathematics education as well as the emerging critical fields of disabilities studies and mathematics education (DSME) and critical mathematics education. More specifically, this chapter will answer the following questions:

1. What do existing studies find are the normative processes that race and disable students in the mathematics classroom?

2. What do existing studies find are the methods of resistance to those normative processes?

The literature review is organized around the DisCrit theoretical framework, specifically the pedagogy of pathologization: hyper-punishment, hyper-surveillance, and hyper-punishment (Annamma, 2020). The literature review also includes a synthesis of DisCrit literature on student resistance. This chapter concludes by examining gaps in the literature and the purpose of this study.

DisCrit Theoretical Framework

Dis/ability critical race studies (DisCrit) is an intersectional framework that analyzes the roles of racism and ableism in education. Originating from Critical Race theory and disabilities studies in education, DisCrit theorizes that the experiences of dis/abled students of color are qualitatively different from the experiences of dis/abled White students, as students of color must navigate the dual burden of being both “raced and dis/abled” (Annamma et al., 2016, p. 13). DisCrit provides a way for researchers to unpack and dismantle the systems that contribute to a perceived failure of multiply marginalized students, including dis/abled students of color.
Here are the tenets of DisCrit (Annamma et al., 2016):

1. Racism and ableism circulate interdependently and often in invisible ways to uphold dominant narratives of normalcy.

2. Individuals hold multidimensional identities rather than singular labels such as a particular gender, race, or ability status.

3. DisCrit recognizes both the social construction of race and disability and the material conditions of being labeled with a specific race or ability status and the impact of such labels on individuals’ experiences.

4. Research must center the voices and experiences of marginalized populations.

5. There is a historical legacy and legal mechanisms through which individuals have been denied educational opportunities.

6. Gains for students with disabilities have primarily been made in the name of interest convergence to maintain the property of White, middle-class citizens.

7. Activism and resistance are required by DisCrit scholars.

Ableism works to reinforce racism, and racism works to reinforce ableism in ways that are normalized and invisible in society (Annamma et al., 2013). DisCrit exposes the social, cultural, political, and economic forces that uphold a racist and ableist system. Ultimately, researchers within DisCrit are advocates and activists who work to resist systems of oppression and privilege the voices of those traditionally marginalized. They problematize the social construction of normalcy and reject the assumption that individuals with differences aspire to be normal.
Pedagogy of Pathologization

For multiply marginalized students within the school system, the pedagogy of pathologization operates to disenfranchise individuals whose identities lie outside the boundaries of what is considered normal (i.e., male, White, nondisabled) (Annamma, 2018). Annamma describes the pedagogy of pathologization as consisting of hyper-labeling, hyper-surveilling, and hyper-punishment. In the following sections, I organized the existing literature on mathematics education within the fields of disabilities studies, DisCrit, and critical race theory related to hyper-labeling, hyper-surveilling, and hyper-punishment.

Hyper-Labeling

Annamma (2018) defined the process of hyper-labeling as “the formal or informal naming of a student’s undesired identity and the addition of other unwanted identities” (Annamma, 2018, p. 14). It problematizes students who do not fit the unspoken yet desired normative standards (Annamma, 2018). Formal naming includes labeling students based on their recognized gender, race, socioeconomic level, and ability status, while informal naming contains terms such as “emotionally damaged” or “deviant” (Annamma, 2018, p. 14). Several studies document how the label of a dis/ability or student of color stigmatizes students in the educational system. Being a dis/abled student of color becomes an unwanted identity in the classroom.

Dis/ability as Deficiency. Disabilities studies in education (DSE) scholars push back against the dominant special education field that conceptualizes disability within students rather than the environment. Although DSE researchers recognize that disabilities exist, DSE researchers focus on changing the system that disables the individuals (e.g., Bagger & Roos, 2014; Collins, 2013; Lambert, 2015; Tan & Katsberg, 2017). They critique research within the field of special education that places dis/abled students within a “medical model deficit view”
The medical discourse prevalent in the field of special education uses terms such as ‘remedial,’ ‘severe,’ ‘debilitating,’ ‘disorders,’ ‘deficient,’ ‘symptoms,’ ‘factors,’ and ‘subtypes’ when describing students with dis/abilities, thereby framing their biological differences as deficits” (Lee, 2015, p. 51). This ability profiling responds to students with a labeled dis/ability by “regarding all his actions and interactions through the lens of deficiency” (Collins, 2013, p. xiii). The medical model discourse and deficiency lens contribute to labeling students with unwanted identities based on their deviation from the norm (Annamma, 2018). This deficit discourse perpetuates the hyper-labeling of dis/abled students in the mathematics classroom (Lambert, 2018).

A case study of professional learning for urban elementary educators working toward equitable education for students with dis/abilities documented how teacher conversations often focused on students’ deficits and inabilities, rather than valuing their unique or different contributions to the math classrooms (Tan & Thorius, 2018): “most of (students without a dis/ability), they get it, they connect it . . . they understand why it’s important . . . I seem to have the most trouble getting them (students with dis/abilities) to synthesize, and process, and understand it” (p. 1012). The educators continued to focus on the students’ inabilities regarding mathematical doing and thinking rather than identifying the students’ assets and contributions to the classroom.

Students are aware of educators’ hyper-labeling of their identities in the school space. A phenomenological study of six African American male high school students investigated their experiences after they were placed in special education (Banks, 2017). The researcher described the students as frustrated with how they perceived their label of a disability. The students challenged whether the label indicated an innate inability or was instead the “result of
inappropriate instruction provided by classroom teachers” (Banks, 2017, p. 102). One student in the study remarked, “there wouldn’t be learning disabilities if teachers ha[d] many different ways of teaching” (Banks, 2017, p. 102). Teacher attitudes and instructional practices placed undue burdens on these students, who often were already hyper-labeled based on their identities as African American, male, and with a disability as unintelligent, lazy, and aggressive.

In another 3-year-long ethnographic study, Davila (2015) documented the classroom observations of dis/abled Latina/o students in their special education class. The study highlighted how the learning center was a “racialized space” where the all-White staff hyper-labeled their predominantly Latina/o students with disabilities (Davila, 2018, p. 454). In their findings, Davila (2018) co-opted the term “disability microaggressions” (p. 454) to describe the treatment of teachers toward students in the special education learning center. The disability microaggressions included times when the teacher referred to the student with the wrong name or disregarded the student because of his disability status in the classroom. Davila (2018) defined disability microaggressions as:

Subtle verbal insults directed at students with disabilities are further characterized as automatic or unconscious layered insults based on one’s disability, race, gender, class, sexuality, language, immigration status, phenotype, accent, or surname. Moreover, they are cumulative and cause unnecessary stress to students with disabilities. (p. 454)

Davila documented the unwanted identities teachers held and openly displayed of their dis/abled students of color. These unwanted identities reflected teachers’ low expectations of their students’ academic performance and abilities.
Deficit Narratives of Students of Color. Deficit narratives of students of color in the mathematics classroom is a form of hyper-labeling by attributing unwanted identities to students of color. Deficit narratives or deficit framing within mathematics education perpetuate the belief that certain students have a decreased capacity to learn mathematics because of their race, class, language, and culture (Ellis, 2008; Flores, 2007; Gutiérrez, 2008; Valencia, 2010). Multiple studies have shown that teachers hold negative perceptions of the students of color as compared to their White students when it comes to academic ability and achievement (Irizarry, 2015a; Irizarry & Cohen, 2019; Oates, 2003) and nonacademic behavior in the classroom (Downey & Pribesh, 2004; Irizarry 2015b; McGrady & Weinstein, 2008). Broader studies have documented Latina/o students’ stereotypes in schools—lazy, aggressive, uncaring, and unmotivated (Valenzuela, 1999). Existing research also documents the underachievement of Latina/o students in mathematics education compared with their White peers (Gutiérrez, 2008). Deficit narratives in the racialized mathematics classroom manifest through an over-emphasis on achievement tests and teacher-held bias.

Standardized testing privileges certain forms of mathematical knowledge and contributes to the labeling of students with fixed identities such as “maladaptive,” “at-risk,” or “low kids” that follow them throughout their educational trajectory (Flores, 2007; Gutiérrez, 2008). These institutional tools often place students of color “behind” their White counterparts on mathematics achievement tests and perpetuate the achievement gap focus without interrogating the opportunity gaps that students of color face in the educational system (Gutiérrez, 2008; Ladson & Billings, 2006). Standardized testing and the research on the achievement gap further cement the hyper-labeling of minoritized youth without examining the opportunity gap minoritized youth face that contributes to their so-called underachievement.
The hyper-focus on the achievement gap by researchers “normalizes” the low achievement of Latina/Latino students in mathematics education (Gutiérrez, 2008, p. 359). In a qualitative study based on the LatCrit methodology of testimonio, Zavala (2014) examined the narratives of Latina/o students in learning mathematics in an urban, multilingual high school located in Pacific Northwestern United States. During the individual and focus groups, the seven students in the study spoke about the role of race in their mathematical achievement. Some of the students used the “universal characteristic” that Latinas/os are violent and alien to explain Latino underachievement, despite recognizing that such a stereotype did not apply to themselves (Zavala, 2014, p. 72). The researcher documented how some of the students had internalized these unwanted identities that placed Latinas/Latinos at the bottom of the racial hierarchy. The study highlights the need to investigate further how students navigate the racial stereotypes of success in mathematics and ideas of who can be mathematically successful.

In their qualitative study of seventy high school girls from school sites in the Midwest of the United States, Carter and colleagues examined the ways that Black girls in the Midwest are racialized and genderized in their high schools, specifically through interactions between adults and students, relationships among peers, and attitudes and expectations that are conveyed through these interactions (Carter et al., 2019). Researchers found that participants detailed experiences of negative assumptions about Black students. For example, one student recalled a teacher commenting that “Black students act like animals,” and another shared that the adults perceived the Black student as “loud, obnoxious, and dumb” (Carter et al., 2019, p. 2545).

**The “Asians are Good at Math” Stereotype.** Although deficit narratives of the inferior intellectual capacity of students of color persist (Irizarry et al., 2021), the dominant discourse regarding the mathematical ability of Asian Americans also operates to hyper-label students with
unwanted identities. In a conceptual paper that used post-structural critical race theory, Shah (2019) argued the false myth that “Asians are good at math” is not a compliment. Rather, it is an unwanted identity that dehumanizes Asian American students by “positioning them as excessively intelligent (over evolved)” (Shah, 2019, p. 662). The myth that Asians are good at math constrains their identities to only being good at math (read boring human calculator) and devoid of other intellectual capacities such as creativity or emotion. The Asians are good at math myth is also part of broader historical and cultural narratives that portray Asians as the subhuman “mongoloid, a yellow peril “national threat,” the forever foreigner, and the overachieving “model minority” (Shah, 2019, p. 667). Furthermore, the myth treats all Asian Americans as a monolithic ethnicity disregarding the multifaceted cultures, histories, and nationalities that compose Asian American racial group.

**Hyper-Surveilling**

Within the pedagogy of pathologization, Annamma (2018) described hyper-surveillance as the “excessive scrutiny in anticipation of problem behaviors, attitudes, or presence” (p. 14). Hyper-surveillance increases as individuals are hyper-labeled as “different, deviant, and dis/abled” (Annamma, 2018, p. 14). For example, teachers may watch a hyper-labeled student closely and send them away when they do not want their presence. Although school personnel may justify this hyper-surveillance as offering additional educational services, hyper-surveillance often causes more harm than help for the student. The literature described how dis/abled students and students of color are hyper-surveilled through segregated learning environments and exclusionary practices within mathematics education.

**Segregated Learning Environments.** Dis/abled students, particularly dis/abled students of color, are more likely to be placed in segregated learning environments (Cosier et al., 2014)
where their “problem behaviors, attitudes, or presence” can be more closely monitored (Annamma et al., 2016, p. 25). These segregated learning spaces act as a “holding place for society’s deviants” that no one wants to teach (Crawford & Bartolome, 2010, p. 157). Dis/abled students who do not fit within the normed beliefs about intelligence, ability, and behaviors are often segregated into a seemingly perpetual “prison of exclusion” (Padilla & Tan, 2017, p. 15).

In a three-year ethnographic study, Davila (2015) documented the classroom observations of dis/abled Latina/o students in their special education class. The study described how that physical classroom segregated students into a space that constructed them as less able. The learning center became a segregated space where the students of color (mostly) with dis/abilities taught by White educators became further marginalized within the larger school context. The study documented how the teachers and aides scrutinized the dis/abled Latina/o students’ academic performance excessively compared to their White counterparts. One student in the study aware of this hyper-surveillance “anticipated being perceived as untrustworthy by teachers and other school staff” because of her use of her learning services (Davila, 2015, p. 457). The student resisted using their learning services to avoid hyper-surveillance.

In inclusive settings where dis/abled students are physically in the same room with their general education peers, educators often segregate dis/abled students within the classroom by grouping them exclusively together to be taught by the special education or resource teacher (Lambert, 2015; Tan & Thorius, 2018). In those segregated settings, students often experience procedural and explicit forms of teaching instead of inquiry-based learning (Lambert, 2015); or remedial math content that “concentrate on remediation and do not offer significant mathematical substance” (Borgioli, 2008, p.140).
A one-year ethnographic and interview study investigated the social construction of ability and disability in a middle school mathematics classroom (Lambert, 2015). The study found that teachers increasingly perceived Luis, who had a labeled dis/ability, as mathematically unable because of his resistance to memorizing mathematical procedures. This hyper-labeling justified the teacher’s placement of Luis in a segregated group for other students in special education where the special education teacher could watch over him. Special educators compelled Luis to focus on memorizing mathematical procedures in that segregated learning space instead of investigating more advanced mathematical concepts. When the teacher emphasized discussion-based learning where students could explore and apply their creative problem-solving skills, students like Luis thrived and were positioned as mathematical doers. However, as the year continued, the mathematics teacher emphasized more rote memorization of procedural mathematics, particularly in anticipation of upcoming standardized testing. Luis resisted this type of “procedural pedagogy” and was positioned as dis/abled by the teacher. The teacher placed Luis in a segregated group with other students in special education, away from his general education peers.

Special educators may not be an adequate resource to support students. A case study of professional learning investigated the practices of special and general elementary educators working to support equitable learning environments for students in mathematics. Researchers found that the special educators lacked the resources to adequately support their students, including a lack of access to textbooks, time to plan, and professional learning (Tan & Thorius, 2017). Rather, special educators professional training focused on “technical and legal issues such as learning to use statewide reporting systems” that surveil dis/abled students’ attainment of specific objectives (Tan & Thorius, 2017, p. 31).
The practice of placing dis/abled students and students of color in segregated learning environments is part of the dysfunctional ecologies of classrooms (Annamma & Morrison, 2018). Dis/abled students of color are the most likely to be viewed as “outflows” of the classroom ecology as educators view them as “intractable problems to be discarded” (Annamma & Morrison, 2018, p. 112).

**Exclusion by Inclusion.** Even when the general education classroom includes dis/abled students and minoritized youth, educators require the students to meet the expectations of the mathematics education as it is, rather than alter the nature of the curriculum to allow dis/abled students greater access (Sheldon, 2013). The presence of a “minoritized youth”1 in the classroom is like that of a guest in a host teacher’s classroom (Calabrese Barton & Tan, 2020, p. 1). As part of a year-long ethnographic study of a sixth-grade science, technology, engineering, and mathematics (STEM) classroom, researchers collected student quotes and experiences that documented how minoritized youth experienced “conditional participation or belonging” in the inclusive classroom (Calabrese Barton & Tan, 2020, p. 1). Educators expected students to follow “majoritarian routines” in the classroom or otherwise face disciplinary actions (Calabrese Barton & Tan, 2020, p. 2).

__________________________

1 Rather than use the term “minority students”, the term “minoritized youth” (Irizarri et al., 2021, p. 4) signals the role of power and systemic oppression in marginalizing students from non-dominant communities. Minoritized youth refers to most students in the United States public school system, including students of color and dis/abled students.
In the case of one Black student, teachers stifled his attempts to discuss the racialized experiences of Black individuals in the STEM industry. They asked him to discontinue his comments on the criminalization of Black people in the United States during a STEM lesson on access. Although the teacher welcomed this student into the learning environment to access the pedagogy and instruction, his “Black body was disavowed” (Calabrese Barton & Tan, 2020, p. 3). The possibilities for engaging in rhetoric that could disrupt historical inequities were dismissed. He needed to follow the normative ways of being in the classroom, ignoring his identity as a Black student. The identities of dis/abled students of color are devalued when they are compelled to follow White middle-class norms of behavior in school settings (Carter et al., 2019) and when their identities are not celebrated or represented through course content (Kyburg et al., 2007).

Unwelcoming or exclusionary learning environments create spaces where only certain students belong or deserve a rigorous STEM education (Irizarry et al., 2021). More students dropped out of advanced placement programs when they believed the learning environment adopted a “one-size-fits-all” approach that did not fit their individual needs. Adults in school settings can respond to the diversity of their students in ways that contribute to an inclusive or exclusive learning environment for students of color (Kyburg et al., 2007). In their qualitative study, Kyburg and researchers collected data through classroom observations and interviews with administrators, counselors, teachers, and students and three urban high schools in the mid-Atlantic states (2007). The researchers investigated key factors in supporting success in advanced courses for students of color. One of the key factors included “environments where student cultural diversity was not only acknowledged and accommodated but also welcomed and
celebrated” through modifications to course content that fit students’ interests (Kyburg et al., 2007, p. 204).

Success in mathematics distinguishes between the non-dis/abled and those who fall outside the norm. The “mathematics for all” movement in mathematics education embodies a cultural and historical belief in the role of mathematics to develop a common value system and the citizenry that values particular norms. All students must reach those values or otherwise be considered a deficit to society (Yolcu & Popkewitz, 2019). The historical and cultural development of mathematics in the United States has contributed to creating able-bodied and objected bodies (Yolcu & Popkewitz, 2019). In the 1940s, the mathematical curriculum focused on developing a citizenry to uphold democratic capitalist ideals: quantity and precision were skills valued in consumers. This rhetoric to develop model capitalist citizens evolved into today’s mathematical thinking standard for developing citizens who can reason, rationalize, adjust to changing circumstances, and “a lifetime of positive attitudes toward mathematics” (NCTM, 2014, p. 259 as cited in Yolcu & Popkewitz, 2019). The mathematics curriculum is a tool for social engineering and ensures a productive citizenry.

In a case study on a middle school Yup’ik student, researchers documented how a Yup’ik student was differently constructed based on whether she was learning in a Western-style mathematics course or a culturally responsive mathematics course (Hogan, 2008). When Nora learned mathematics in a “Western math, teacher-centered” learning environment (Hogan, 2008, p. 110), she was constructed as a math student who “likes to work alone,” “nice,” and “hard-working” (Hogan, 2008, p. 108) by her White, male mathematics teacher. This description stands in stark contrast to how she was constructed as a mathematics student when she learned mathematics that situated the mathematical concepts in Yup’ik cultural context. In that class, the
female Yup’ik teacher described her as a “genius in math” who quickly learned concepts and taught them to her peers (Hogan, 2008, p. 108). Nora’s identity was devalued in the Western mathematics classroom when she had to follow Western conventions of working alone, following teacher-centered methods of instruction, and learning decontextualized mathematics; she did not thrive as a mathematician. Devaluing the identities of mathematical learners can contribute to deficit narratives of their abilities and exclude them from the learning environments.

**Hyper-Punishment**

Hyper-punishment is the excessive or preemptive form of punishment directed toward students who have been hyper-labeled as different and hyper-surveilled as unwanted (Annamma, 2018). The literature on mathematics education describes how dis/abled students and students of color the hyper-punishment manifests in the form of discursive practices: a subpar curriculum that limits their opportunities to access advanced mathematics and debilitating teaching practices. In a society where personhood is defined by intelligence, including mathematical knowledge (Gholson & Wilkes, 2017), these discursive practices reify the dehumanization of dis/abled students of color.

**Subpar Curriculum.** The deficit-oriented language frames disabled students as less able and often justifies their exclusion from rigorous, enriching, and inquiry-based mathematics. Too often, the hyper-focus on student differences and dis/ability constrains students’ access to learning mathematics (Sheldon, 2013). The literature on disabilities studies in mathematics education repeatedly calls out the deficit-oriented language and practices that frame disabled students as less able: “it is ableist to assume that a student with LD cannot think conceptually or cannot benefit from an engaging and rigorous inquiry curriculum” (Lambert, 2018, p. 8).
Researchers and practitioners within special education often comply with a false belief that in mathematical learning, students must first demonstrate a strong understanding of rote procedural mathematics before they can explore or experience rich, conceptual, problem-solving tasks (Lambert, 2018; Sheldon, 2013). Furthermore, there is a prevailing false myth that students with learning disabilities cannot do conceptual, inquiry-based learning mathematics (e.g., Borgioli, 2008; Lambert, 2018; Sheldon, 2013). This myth leads to practices within special education that constrain student ability by limiting their exposure to more rigorous or complex forms of mathematics.

Dis/abled students who “struggle” with mathematical learning are denied access to “authentic, relevant, and engaging” mathematical learning that would allow students to “construct identities as mathematical thinkers” (Lambert, 2015, p. 8). Lambert (2015) found that students who continued to struggle in procedural, rote mathematics were often separated from their peers to receive more intense support. However, this separation often led to denying those students access to learn more rigorous, conceptual mathematical consent alongside their nondisabled peers. Their peers and teachers often viewed the separated peers as deficient because they struggled with specific procedural or rote mathematics.

The narrow definition of what counts as mathematical learning and intelligence contributes to a “culture of exclusion” in mathematics education for minoritized students (Louie, 2017, p. 489). Because of the dominant, traditional view that pathologizes disabled students in mathematics education as less able than their peers, dis/abled students are often prescribed to learn mathematics in rote memorization of procedural steps and formulas with few opportunities to engage in conceptual understanding of the mathematics (Beatty & Bruce, 2012; Borgioli, 2008). According to Crawford and Bartolome (2010):
There seems to be an uncritical acceptance of a unilinear curriculum in special education in which no matter how old the students, teachers begin with... simplistic concepts. (p. 162)

A research study was conducted to investigate the impact of instructional strategies that prioritize visual representations on dis/abled students’ conceptual understanding of linear relationships (Beatty & Bruce, 2012). Three hundred forty-two Grades 7 and 8 students across two different school districts participated in the study. Ten percent of the students were identified with a learning dis/ability and followed an IEP. The study found that “students with learning disabilities were able to make connections among different representations of linear relationships” (Beatty & Bruce, 2012, p. 29). The study challenged traditional instructional strategies for students with dis/abilities who are traditionally taught through rote memorization of steps and formulas with “little exploration to the underlying meaning of the mathematics with which they are engaged” (p. 30). These traditional practices are justified for dis/abled students who are considered as “only having the capacity to engage in rote and repetitive mathematics” (Beatty & Bruce, 2012, p. 36). Dis/abled students are often denied opportunities to engage in higher levels of mathematics. One student in the study commented on the benefits of the pictures, animations, and multiple representations as opposed to their previous learning experiences where they had to memorize teacher-directed methods:

Having the pictures and the animation on CLIPS was good, so there are different kinds of pictures, the graph, and the robot too. So, there was more than one way to see things, which helped a lot! I learned mathematically that there are different ways to show things. Especially last year, our teacher was very much, “This is how you do it.” And this way [using CLIPS] it showed, oh you can do it
like this, you can put it in a graph, you can use just the formula, you can draw a picture. So that’s what I really liked. That there was more than one way. (Beatty & Bruce, 2012, p. 31)

By shifting how teachers taught mathematics, dis/abled students could “construct deep conceptual understanding of complex algebraic relationships” (Beatty & Bruce, 2012, p. 35) and engage in content that they previously denied because of their perceived lack of ability. Furthermore, this study was conducted with students who had identified learning disabilities learning alongside their general education peers. The study identified that by shifting their instructional strategies, the teachers ensure that their dis/abled students could remain and participate in the classroom.

Educator attitudes and conceptions about what it means to do and learn mathematics contribute to privileging certain types of mathematical knowledge (i.e., Algebra rather than Statistics), mathematical discourses (i.e., visual rather than auditory), and habits (i.e., speed and fluency rather than slow and conceptual). Students who learn and do mathematics differently than the privileged types, habits, and discourse are often viewed as less able, justifying their exclusion from learning an enriching and advanced mathematical learning environment alongside their peers. Neurocognitive research on mathematical thinking for students with mathematical dyslexia problematizes the field’s rigid definitions of numeracy. According to de Freitas and Sinclair (2015):

Thus, our argument operates at two levels: on the one level, we show how this kind of research produces dis/ability in human bodies through its image of what constitutes number sense, and on the other level, we show how this research assumes that cardinality is the fundamental
function of number. This dual focus allows us to show how mathematics itself is strongly linked to historical embodied practices, and that particular images of a number are validated through particular kinds of research and policy -- the ways that we define mathematics can dis/able individuals by valuing one kind of knowing over another. (p. 223)

The focus on the cardinal understanding of mathematics privileges some students while dis/abling students who have a different understanding of number sense. The mathematics curriculum produces abled and dis/abled bodies (Borgioli, 2008; de Freitas & Sinclair, 2015). When students are identified as struggling to recall mathematical procedures quickly or participate in specific mathematical discourses, they are often pulled out of the classroom for separate services or segregated into different learning spaces (Borgioli, 2008; D’Souza, 2015; Lambert, 2015). When mathematics is considered a visual activity, it “constricts” the blind student who is seen as “less capable of pursuing mathematics” and privileges the sighted student as capable of mathematical learning (D’Souza, 2016, p. 2).

In their published literature review, Lambert and Sugita (2017) identified published literature in special education journals that described how adjustments to the classroom environment—teacher moves, learning activities, and group work—promoted student engagement and participation in the mathematics classroom. However, minoritized youth continue to be subjected to debilitating practices that limit students’ access to mathematical success (Irizarri et al., 2021; Annamma et al., 2020).

**Debilitating Teacher Practices.** The negative bias that teachers hold toward minoritized youth impacts their interactions with students and teaching practices in the classroom (Carter Andrews et al., 2019), thereby reproducing racial and ability hierarchies in schools. A case study
examined the learning environment for incarcerated female students of color, often labeled with a learning dis/ability (Annamma et al., 2020). They described how the physical placement of students already positions them as individuals who are incapable of learning and behaving normally. These debilitating teacher patterns included withholding academic support, responding to students with adverse and unhelpful responses, and denying rewards to the students. The “debilitating practices” represent ableist and racist patterns that “disrupted engagement and meaningful learning” for the students who responded by feeling disconnected from school (Annamma et al., 2020 p. 5).

In their qualitative study of seventy high school girls from school sites in the Midwestern United States, Carter and colleagues examined how Black girls in the Midwest are racialized and gendered in their high schools. Several students described a hyper-disciplinary environment where Black students were punished more often than their White peers, often for nonmenacing actions such as advocating for their grades. One student described being sent out of the classroom by the teacher “for laughing” (Carter et al., 2019, p. 2545). Furthermore, the students described a learning environment that constructed Whiteness as intelligence: “adults expect us to be perfect and white” or face disciplinary action (Carter et al., 2019, p. 2547).

**Systemic Violence.** The subpar curriculum and debilitating teaching practices contribute to the systemic violence within mathematics education that students, particularly Black students, face (Martin et al., 2019). Martin et al. (2019) argued that systemic violence manifests physically, symbolically, and epistemologically in mathematics education. They highlighted the violent arrests of a Black teenager in her mathematics classroom who refused to put her cellphone away and her female classmate who stood up in protest during the incident as examples of the physical violence Black students face when being “disruptive” and
“disrespectful” (Martin et al., 2019, p. 38). Mathematics classrooms are not immune to the racist forces that contribute to the adultification of Black students who face hyper forms of punishment in classrooms that operate as “sites of authoritarianism and compliance” (Martin et al., 2019, p. 40).

Black learners also experience “symbolic violence” (Martin et al., 2019, p. 40) through the overemphasis of the achievement gap that places Black students at the bottom of the racial hierarchy, the belief that mathematics is property held by Whites and Asians, and the disproportionate tracking into segregated learning spaces. The mathematics curriculum itself also serves as a form of symbolic violence, such as the case highlighted by researchers where Black students at a middle school in Alabama were asked to solve mathematical problems like, “Dwayne pimps three ho’s. If the price is $85 per trick, how many tricks per day must each ho turn to support Dwayne’s $500 per day crack habit?” (Martin et al., 2019, p. 42). Such curriculum perpetuates the deficit narratives of Black individuals in mathematics learning space and contributes to symbolic violence toward Black students.

Quantitative research that documents the mathematical illiteracy of Black students serves as a form of epistemological violence by normalizing the insubordination and dehumanization of Black students (Martin et al., 2019). The statistics that Black students underperform their more affluent White peers are often justified by dismissing the intellectual capacity of Black children and reaffirming that they enter school with educational deficits. Studies largely ignore the mathematical sense-making Black children already possess and instead focus on identifying deficits, interventions, and methods to repair broken Black minds (Martin et al., 2019). Although their research focuses primarily on Black bodies and minds, this systemic violence permeates the
mathematics classroom occupied by other minoritized youth, including dis/abled students of color.

**Reframing Student Mis/behavior as Resistance**

Critical studies reframe student mis/behavior as student resistance to the pedagogy of pathologization prevalent in classrooms. The studies highlight how behavior or mis/behavior is socially constructed and shaped by normative standards of being in the classroom. In his anthropological study on the student class clown as a subversive symbol of hegemonic ideologies that persist in schools, McLaren defined resistance as the meaningful behavior that challenges the “legitimacy, power, and significance of school culture and instruction” (McLaren, 1985, p. 85). McLaren (1985) further pointed out that to categorize student behavior as resisting, rather than reinforcing, hegemonic ideologies, researchers must unpack the “subjective reasons that students give” (p. 85) as to why they are resisting. These reasons must be located within social, cultural, and historical contexts in ways that connect to hegemony, ideology, and human agency.

Giroux (1983) defined resistance as having two dimensions: a critique of social oppression and an interest in social justice. In their qualitative inquiry that used critical race theory to study the counter-stories of Chican@ students, Solorzano and Bernal (2001) adapted Giroux’s definition of resistance. They identify four forms of “student oppositional behavior” according to students’ awareness of injustice: reactionary, self-defeating, conformist, and transformative (Solorzano & Bernal, 2001, p. 316). The categories provide a template to understand and analyze students’ “critique of oppression and their motivation for social justice” (Solorzano & Bernal, 2001, p. 316).
Resistance can take on many different forms: in large forms through protest movements that generate solidarity or in small forms such as speaking at a public meeting or even telling oneself that a school administrator does not speak for you (Gutiérrez, 2013). These transformative forms demonstrate a strong critique of hegemonic narratives that marginalize students while also attempting to change the system that maintains such oppression (Solorzano & Bernal, 2001).

In a three-year ethnographic study of 34 elementary Latina/o students in the Midwest and Southwest United States who attended predominantly Latina/o urban schools, CRT researchers documented how students resisted the school system’s narrative of what it means to do and learn mathematics (Varley Gutiérrez et al., 2011). Some of the students resisted external validation of performance from the teacher or test scores and instead preferred their “own strategy” or “way of finding” the answer (Varley Gutiérrez et al., 2011, p. 33). The student resisted certain forms of learning that were valued in their classrooms, such as the emphasis on speed and regurgitating preferred teacher methods. Instead, the students valued their mathematical strengths that were not recognized in the classroom. The students recognized and challenged the school system that rewarded “playing the game” of schooling: turning in the work and paying attention (Varley Gutiérrez et al., 2011, p. 34). Furthermore, the study documented how students recognized and challenged the low expectations set for them in their mathematics classrooms, as demonstrated through their teachers’ limited, nonadvanced mathematical curriculum that focused primarily on teaching basic numerical operations. The students’ transformative resistance demonstrates students’ critique of their schooling conditions while maintaining their integrity as learners and individuals.
In the DisCrit studies on students’ experiences in school, the students “resist” (Banks, 2017), “pragmatically strategize” (Ferri & Connor, 2010, p. 11), and “maintain and defend their integrity” (Annamma et al., 2020, p. 19). The students are positioned in these studies not as passive objects to be studied, experiencing their marginalization but as active, transformative agents navigating an often-oppressive environment.

A phenomenological study examined how six African American male students resisted “deleterious stereotypes” that resulted from labeling and how they chose to “successfully navigate the unintentional pitfalls of their various school environments” (Banks, 2017, p. 97). The study documents how students challenge the ableist, sexist, and racist attitudes of teachers that position the students as learning disabled. African American students with disabilities, and others at risk of being labeled with disabilities, require “self-determination preparation that arms them with knowledge of their learning styles along with an understanding of historical oppression and provides them with the skills to be empowered to recognize and correct racism and ableism in their daily educational lives” (Banks, 2017, p. 106).

Ferri and Connor’s (2010) qualitative study with young women of color in urban special education programs investigated how the girls rewrote their cartographies of girlhood and enacted strategies of creative resistance. The study found that the girls are proud of their lives and “pragmatically strategizing” around barriers they face in their context (Ferri and Connor, 2010, p.11). According to Ferri and Connor (2010):

And, yet, she is proud. Proud of her race and her ability to work hard. Proud of managing to get where she is. Proud of not giving up on herself. Proud of figuring out the world in her own way: critical of how society, educational advantage, and
power works; conscious of her assigned position within these multiple systems; and, pragmatically strategizing what she can do about all of it. (p. 119)

The incarcerated female, dis/abled students of color refused to accept their inequitable support. They intentionally resisted marginalization through (re)positioning or “maintaining and defending their integrity” by speaking out, remaining silent, and being punished for repositioning (Annamma et al., 2020, p. 19). The studies highlight the ways that the environment oppresses the individuals as well as the ways the students attempt to fight back against such forces.

Davila (2018) documented how students resisted the low expectations that their teachers displayed of their abilities by either choosing not to respond or to refuse their special education services. The teachers’ displayed “disability microaggressions” such as commenting shock and surprise when a student completed an assignment or sarcastically remarking how their work was challenging. The student did not challenge the teacher’s remarks verbally and instead “hung his head low and left the room” (Davila, 2018, p. 455). Other students responded by strategically and intentionally refusing their special education services to challenge their teachers’ low expectations of them. They were attempting to “prove them wrong” by showing that they can succeed without their “help” (Davila 2018, p. 456) and resisting being “outed” as a dis/abled student. Davila positioned the students as active resistors, rather than passive victims, to their learning environment that constrained their abilities and opportunities.

Gaps in the Literature

The literature on dis/abled students in mathematics education demonstrates an over-reliance on quantitative methods, a need to address students’ multidimensional identities, and a lack of student voices and experiences in the research.
Over-Reliance on Quantitative Methods

Research on dis/abled students in mathematics is heavily quantitative and focuses on students’ performance on standardized achievement tests (Lambert & Sugita, 2017). A literature review by Lambert and Tan (2019) investigated research methodologies used to study dis/abled students by comparing 2,477 journal articles published in English between the years 2013 and 2017 on the teaching and learning of mathematics from prekindergarten to 12th grade to dis/abled students and non-dis/abled students. They found that research on students with dis/abilities was overwhelmingly quantitative (81%) and used behavioral and medical theoretical orientations. They attributed the reliance on quantitative/experimental methods as a feature of the medical model paradigm that dominates the field of special education, where educating disabled students is akin to treating a condition or deficit in students. They recommended that more researchers focus on qualitative measures such as interviews, focus groups, classroom observations, and lesson studies to investigate the classroom practices that support dis/abled students, a conclusion similar to other findings by DS scholars (Cosier, 2013).

Addressing the Multidimensional Identities of Students

Individuals hold multiply identities beyond the singular label of race, gender, sex, and status. These multiple identities and intersectionality often lead to experiences of “multiply oppressed” (Annamma et al., 2020). Framing the students through an intersectional lens recognizes the “myriad of oppressions that manifest in the lives of (Girls of Color) because they are marginalized by interlocking oppressions that shape their lives and experiences in schools” (Annamma et al., 2020, p. 5). Within mathematics education research, there is a need to address the multidimensional identities that students embody that impact their learning in the classroom.
Tabron and Ramlackhan’s (2019) quantitative study, one of the only ones found using quantitative methods and DisCrit theoretical framework, investigated how a student’s characteristics predict the likelihood a student receiving special education services would graduate with a college prep diploma as compared with peers who do not receive special education services. The study’s findings concluded that students who experienced “triple jeopardy” (Tabron & Ramlackhan, 2019, p. 196)—namely sexism, racism, and ableism—are more likely to drop out of school. Dis/ability does not simply replace race in these instances but represents a complex interplay of race and disability in the lives of students of color in special education (Davila, 2015).

A Lack of Student Voices and Experiences

Aside from classroom discourse, the voices and perspectives of dis/abled students (Annamma et al., 2016; Tan & Katsberg, 2017) and students of color (Zavala, 2014) are largely absent in research literature on equity in mathematics education. Furthermore, no published studies used a DisCrit lens to analyze mathematics learning in the classroom. Instead, the studies included in this section use the DisCrit framework to examine students’ experiences in schools and classrooms in general. These studies described more in detail next used qualitative methodologies that centered on student voices and experiences in school, highlighting the construction of ableism and racism in these institutional spaces, and recognizing the burden of intersectional oppression “multiply marginalized” (Annamma et al. 2016) individuals face in the classroom as they are simultaneously raced and dis/abled (Adams & Erevelles, 2016).

The articles reviewed used DisCrit as a theoretical framework centered on students’ voices to understand their lived experiences. They used qualitative methods, particularly in-depth interviews (e.g., Annamma, 2020; Banks, 2017; Ferri & Connor, 2010). The authors explicitly
pointed out their intentions in centering these voices in the study as a means to disrupt or counter the narratives that frame or position these individuals as damaged, deficient, or irrelevant (Ferri & Connor, 2010). The disability rights movement often speaks of fighting back against a system that often speaks for and acts for individuals with disabilities without consulting them, a sentiment encapsulated in the phrase “Nothing about us, without us” (Charlton, 2000, p. 3). In the realm of education, dis/abled students described as damaged, deficient, or irrelevant become passive agents in their education trajectories because educational specialists, parents, and teachers make decisions about their placements and goals (Annamma et al., 2016). Traditional research, particularly in special education, has failed to attend to students’ lives and experiences in ways that will critique or counter the disabling forces of the educational environment (Annamma et al., 2016).

**Purpose of This Study**

DisCrit offers a framework to rethink equity in mathematics education by decentering Whiteness and ableism and reframing dis/abled students of color as knowledge generators. Centering the learning experiences of dis/abled students of color in the mathematics classroom by using the DisCrit theoretical framework will illuminate the normative forces ableism, racism, and other forms of oppression students face. Furthermore, this study highlighted how dis/abled students of color are active agents in their learning journeys who successfully navigated and resisted oppressive forces in their learning environments.

Researchers have recently called for more qualitative studies such as interviews and classroom observations to contextualize findings in these quantitative studies in special education research on mathematics education (Bagger et al., 2020; Cosier et al., 2014; Lewis & Fischer, 2016; Sheppard & Weiman, 2020). The field of special education neglects to attend to
systemic causes of over and underrepresentation of minorities in disability categories (Connor et al., 2019).

When Crenshaw (1992) argued for the recognition of intersectional identities, originally focusing on the intersectionality of African American women who experience racism and sexism, she criticized efforts of feminism that only addressed the forces of sexism, which left African American women to continue to face disadvantages because of their race. Addressing the needs of those who live within the intersections of oppression, Crenshaw (1992) noted that such efforts would also work to uplift the “singularly disadvantaged” (p. 167). Working to address the needs of dis/abled students of color who experience the intersectional oppression of ableism and racism is not too narrow. Rather, this effort and its solutions address the needs of students of color and students with disabilities, the singularly oppressed.

DisCrit focuses on the multiple forms of oppression that dis/abled students of color face and particularly brings racism into the conversation, especially in the field of special education, where acknowledgment of racism in education continues to remain largely disregarded (Connor et al., 2019). Centering the voices and perspectives of dis/abled students of color in the mathematics classroom and research field provides a valuable contribution to the field. It expands the mathematics field beyond the traditional scope that has historically, culturally, and socially excluded dis/abled individuals (Tan & Katsberg, 2017).

For these reasons, counter-stories are critical to understanding the experiences of dis/abled students of color learning mathematics. The stories, experiences, and narratives of multiple marginalized are essential to understanding the broader systems of oppression (Rodela & Rodriguez, 2020). Counter-stories disrupt the dominant perceptions of marginalized individuals by revealing the realities of racism, ableism, and other forms of oppression (Huber
2008 as cited by Rodela & Rodriguez, 2020). Majoritarian narratives position nondisabled, white students as the normative center within mathematics education.

This study attempted to address the gaps in research by answering the following questions:

1. How do dis/abled students of color interpret being raced and disabled in the mathematics learning environment?

2. How do dis/abled students of color resist the normalizing process of racism and ableism in the mathematics classroom?
CHAPTER 3: METHODS

Chapter 3 presents the rationale behind the research methods design and my role as the researcher in this study. I discuss my positionality and how the data collection and analysis procedures attend to the disability studies and critical race theory (DisCrit) theoretical framework. While DisCrit does not provide a specific methodology, it does provide a framework for selecting an appropriate methodology that attends to the aims of DisCrit as an emancipatory framework for the multiply marginalized. This study addressed the following research questions:

1. How do disabled students of color interpret being raced and disabled in the mathematics learning environment?

2. How do dis/abled students of color resist the normalizing process of racism and ableism in the mathematics classroom?

DisCrit, the conceptual framework of this study, emphasizes that researchers do not “give voice” (Annamma et al., 2013, p. 14) because dis/abled students of color already have a voice. Instead, tenet four of DisCrit proposes that researchers privilege the voices of marginalized populations traditionally left out of the research. As the voices and experiences of dis/abled students of color and dis/abled students are mainly absent in research on students in mathematics education research (Tan & Katsberg, 2018), researchers need to use methods that highlight students' experiences. Particularly, researchers need to respond to injustice by eliciting their counter-stories that push back on master narratives (Annamma et al., 2016, p. 21).

To avoid a research study that speaks for these students and reinforces paternalistic notions, I sought a humanizing methodology that centers the voices and experiences of the participants in this study. I chose to use a phenomenological methodology through Educational Journey Maps and semi-structured interviews to illuminate the detailed descriptions and personal
meanings of the lived experiences of dis/abled students of color as they learned mathematics in high school. A phenomenological method promotes epistemic agency, affirmation, and healing through collective sharing (Andrews et al., 2019). I did consider an ethnographic approach that would identify shared patterns of a cultural group - dis/abled students of color - to study the constructions of racism and ableism in the classroom. However, this method was not feasible due to outside researchers’ COVID-19 restrictions on classroom observations. The Institutional Review Board that approved this study limited the data collection to virtual-only due to in-person data collection’s health and safety concerns during the Covid-19 Pandemic.

**Methodological Approaches**

**DisCrit**

DisCrit is a theoretical framework that engages with intersections of disabilities studies (DS) and critical race theory (CRT; Annamma, 2016). Operating under the premise that race and disability are both socially constructed and interdependent, DisCrit examines the normalizing process of ableism and racism that operate within the school system. More specifically, it seeks to illuminate how “interactions, procedures, discourses, and institutions of education” (Annamma, 2016, p. 14) uphold hegemonic beliefs about ability and race that negatively impact dis/abled students of color.

Tenets 2, 4, and 7 of DisCrit shaped this research study’s data collection and analysis methods (see Table 1). Tenet 2 of DisCrit (Annamma et al., 2016) recognizes that dis/abled students and students of color are not a monolithic group. Individuals hold multiple identities - race, class, gender, ability status, ethnicity, national origin, sexual orientation, immigration status - that add complexity to their experiences. This study attended to the identity markers of ability and race in recruiting participants who identified as a dis/abled person of color. The interviews
also focused on understanding their lived experiences as dis/abled students of color. However, this study’s analysis, findings, and recommendations emphasize that these are not generalizable results that should be attributed to all dis/abled students of color. There is a danger in essentialism (Gutiérrez, 2013) or using a single identity marker to characterize an individual’s needs and experiences. By attending to the multiple identities that the participants hold, this study analyzed the nuanced and complex ways that the participants interpreted and resisted ableism and racism in the mathematics classroom. Using counter-stories to share the findings of this study attended to the nuanced and complex experiences that the participants shared during the study. For example, while there were three Asian-American participants in this study, they experienced mathematical learning differently. These differences are captured in their individual case study counter-stories.

Tenet 4 of DisCrit (Annamma et al., 2016) focuses on centering and privileging the voices of those historically marginalized and often left unacknowledged in research. This study recruited participants who self-identified as dis/abled students of color and used semi-structured interviews and focus groups to capture descriptions of their experiences. During the focus groups, participants asked questions or initiated discussions around what they found to be salient in each other’s descriptions of experiences learning mathematics in school. The thematic analysis (Van Manen, 1990) used to analyze the participants’ descriptions allowed me to compile both a single case and cross-analysis of the participants' experiences. The single case analysis presented as counter-stories (Solórzano & Yosso, 2002) center each of the participant’s unique experiences.

Finally, Tenet 7 of DisCrit (Annamma et al., 2016) pushes scholars and researchers to view their work as forms of activism and resistance. This study’s methodology was designed to
elicit data that pushes back on dominant narratives within education and mathematics education that positions dis/abled students of color as incompetent (Irizarri et al., 2020), needing to be fixed (Borgioli, 2008), segregated (Tan, 2017b), or spoken for (Lambert, 2015). This study provided space for participants to collectively share their experiences and strategies to push back on disabling barriers they faced in their educational journeys. Furthermore, understanding and naming how dominant ideologies perpetuate educational inequities fosters activism (Mendoza et al., 2016). Table 1 outlines how the research design attends to the tenets 2, 4, and 7 of DisCrit.

Table 1

DisCrit Informed Research Design

<table>
<thead>
<tr>
<th>Tenets of DisCrit</th>
<th>Alignment to research design</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. DisCrit values multidimensional identities and troubles singular notions of identity.</td>
<td>While foregrounding the identity markers of race and ability, this study did not discount the other markers of difference in addition to race and ability, such as language status, sexuality, gender, immigration status, and socioeconomic class. Instead, the “multiple stigmatized identities add complexity” (p. 20) to understanding the lived experiences of dis/abled students of color in the mathematics classroom. The research study recruited participants who self-identified as disabled people of color. Dis/abled people and people of color are not a monolith. The data collection and analysis revealed that other identity markers such as socioeconomic status and gender added complexity to their experiences. The counter-stories compiled from their descriptions emphasize the complexities of their identities and experiences.</td>
</tr>
<tr>
<td>4. DisCrit privileges the voices of marginalized populations, traditionally not acknowledged within research.</td>
<td>This study used a critical phenomenology methodology to ground the data in participants’ lived experiences. The data collected through semi-structured interviews elicited thick descriptions of how dis/abled students of color experienced learning mathematics. The semi-structured interviews were also structured to provide</td>
</tr>
</tbody>
</table>
a safe space for participants to share their experiences. Participants were reminded of the study’s goals: their experiences would deepen our understanding of (in)equitable learning environments. The data analysis and findings centered the voices and experiences of the participants.

7. DisCrit requires activism and supports all forms of resistance.

The focus groups provided a space for participants to share experiences and barriers they faced in their learning experiences. It also fostered a sense of solidarity among participants who identified common experiences with others. Sharing their experiences provided a means for participants to talk back to master narratives in their educational journeys.

Critical phenomenology used in this study compels researchers to move beyond describing experiences and instead strategize emancipatory actions (Willen, 2007).

**Phenomenology**

For this study, I chose a phenomenological qualitative approach to study the essence of the participants’ experiences learning mathematics as dis/abled students of color. A phenomenological approach seeks to, in a systematic way, illuminate how individuals experience the world; it is a study of the lived experience of a particular phenomenon (Van Manen, 1990). Phenomenological studies do not produce generalizable results or theories explaining or controlling a problem. Instead, phenomenology brings us in more “direct contact with the world” (Van Manen, 1990, p. 9). By investigating lived experiences of specific phenomena, phenomenologists reveal parts of the world that often go unnoticed or unknown. This phenomenological research design centers on how the study’s participants experienced learning mathematics as disabled students of color.
Critical Phenomenology

Critical phenomenology lies at the intersection of critical theory and phenomenology. Critical phenomenology remains rooted in the phenomenological tradition of centering first-person descriptions of their experiences while emphasizing intersubjectivity over subjectivity (Guenther, 2020). It allows for reflexivity and the researchers to connect their own experiences with the participants. Researchers carry varying degrees of sensitivity to the study based on previous readings and personal experiences related to the data. This intersubjectivity permits researchers to give meaning to data, the capacity to understand, and the ability to discern meaningful data. Furthermore, critical phenomenology calls on researchers to critically consider the context of the lived experiences described by participants. Critical theory openly positions itself on the side of liberation and emancipation, considering how “knowledge, power, and domination” (Giroux, 2017, p. 38) make meaning in the world. Critical phenomenology is often used in researching the experiences of marginalized and targeted communities. For example, critical phenomenology has been used to explore double consciousness in students from a racialized city (Dahan et al., 2019), the experiences of middle school Black girls enduring sexual harassment (Harris & Kruger, 2020), the experiences of first-generation Latino/a college students (Becerra, 2020), and Black families’ perceptions of place and pursuit of quality schools (Nickson, 2020). All the studies use a phenomenological approach to data collection, relying on interviews and participant voice while also using a critical perspective to craft the questions, interpret the data, and provide opportunities for the research to connect their own stories to the data.

A critical phenomenological approach demands attention to two interrelated dimensions of social life: first, to the conditions of structural inequality and structural violence that shape
participants’ position and status; and second, to the impact of these contextual factors on participants’ individual and collective experiences of being-in-the-world (Willen, 2007).

Critical phenomenology centers on the experiences of the marginalized and oppressed to identify and transform everyday experiences of injustice and render the “familiar a site of oppression for many” (Murphy et al., 2019, p.13). It uncovers phenomena that can “teach us about the lived experience of power and oppression and the role of transcendental social structures in shaping this experience” (Guenther, 2020, p. 37). This methodological approach contributes to the struggle for liberation from structures that privilege, naturalize, and normalize specific experiences while marginalizing, pathologizing, and discrediting other experiences (Willen, 2007). Critical phenomenology compels researchers to move beyond describing the conditions of oppression and instead toward developing strategies to dismantle the structures that uphold such conditions of oppression:

(The) critical phenomenological perspective helps social scientists better understand the form, contours, texture, and dynamics of . . . everyday lives in diverse host society settings, but it can also help ethnographers sensitize policymakers, politicians, and potentially even broader public audiences to the challenging, often deeply anxiety-producing, at times terrifying consequences that laws and policies frequently generate (Willen, 2007, p. 28).

This research study informs students, researchers, and educators aiming to advance equitable structures of mathematical learning. The interview questions and prompts addressed issues of power and oppression within the mathematics classroom. For example, one of the interview questions asked, “If disability impacted your mathematical learning, give an example. What stood in your way and what helped you be successful?” (see Appendix A). The
counternarratives produced from this study unmasked the everyday occurrences of ableism and racism that operative explicitly and implicitly within the mathematics classrooms.

**Ethical Framework**

The ethical framework of this is grounded in Tenet 7 of DisCrit, which attends to research as activism (Annamma et al., 2013) and in the culturally responsive methodologies that require researchers to consider the power and privileges we hold when studying communities (Soohoo, 2018).

**Theory as Activism**

This study provided a platform for participants to share their counternarratives as a “form of academic activism to talk back to master narratives explicitly” (Annamma et al., 2013, p. 14). DisCrit researchers provide a platform for participants to talk back to the narratives that frame participants as deficits. The counter-stories collected in this study act as a form of activism by providing a platform for participants to talk back to deficit narratives.

Tenet 7 requires that researchers “support activism and promote diverse forms of resistance“(Annamma et al., 2016, p. 25). By taking this stance, DisCrit compels research and academic work to be connected to the community and avoids the ivory tower stance that researchers traditionally hold. Research should be done alongside participants, with participants, instead of on participants. Solutions need to be community-driven rather than handed down from people who know nothing about the community attempting to fix the problem. I ensured that participants’ voices and experiences drive the findings and solutions. Participating in this study was the first time they shared their experiences with other dis/abled students of color or with another individual outside their network. Dis/abled people have had fewer opportunities to congregate in ways that support building critical consciousness of their identities and ableist
structures, unlike other marginalized communities (Campbell, 2008). Furthermore, the “dispersal generates internalized ableism” as dis/abled people adopt the belief that associating with other dis/abled people is undesirable (p. 155).

I invited the participants to interrogate their experiences to analyze how teachers, curriculum, and peers upheld racist and ableist views. Furthermore, the participants shared strategies they used to resist those normalizing processes. During the final interview, they were invited to share specific ways that educators can better support students like themselves.

Theory can be activism. Activism does not necessarily mean sit-ins and marches, an ableist notion (Annamma et al., 2016). Activism can take place behind a desk. Theory can be a source of activism by “offering oppressed groups a language of critique and resistance” (Annamma et al., 2016, p. 26). By illuminating the experiences of dis/abled students of color as they learn mathematics, the findings of this research can be emancipatory by providing ways to critique the oppressive conditions of mathematics education and reposition the students, not as passive victims but active resisters to those conditions:

“If theory can be violent, that is, if theory can erase large portions of the population by ignoring their needs and realities, we also believe that theory can be emancipatory, offering oppressed groups a language of critique and resistance” (Annamma et al., 2016, p. 26).

As a mathematics educator who has struggled with the cognitive dissonance in equity work for students, this study provides a language of critique for mathematics educators and students who have felt the forces of ableism and racism in their classrooms. While I hope that the counternarratives presented in this study resonate with other dis/abled students of color, the discussion and implications speak directly to educators aiming to advance equitable learning environments for all students.
Culturally Responsive Methodologies

Because the research study was with a marginalized community, dis/abled students of color, I chose to also use culturally responsive methodology (CRM) as an ethical framework (Berryman et al., 2013). CRM is rooted in critical and indigenous frameworks and views knowledge as “co-created” (Berryman et al., 2013, p. 3) between participants and researchers. The researcher is the learner, not the expert. CRM researchers recognize that they carry “colonial privilege” (Berryman et al., 2013, p. 6) and need to unlearn practices that might position them as the expert researcher who is considered the “purveyor of truth” (Berryman et al., 2013, p. 6). Instead, CRM researchers focus on researching with instead of on participants (Berryman et al., 2013. CRM requires that researchers enter the community with humility, reciprocity, dialogue, and relationship building (Berryman et al., 2013. The knowledge creation from a research study is grounded in power and control, mediated by addressing the following concerns in the research process: (a) initiation: how was the research initiated? (b) representation: whose ideas and realities are represented? (c) benefits: who benefits from the research? (d) legitimation: whose needs, interests, and concerns does the research represent? I accountability: to whom are the researchers accountable? (Berryman et al., 2013).

Initiation. As a nondisabled mathematics educator of color, I was concerned about what I witnessed as disabling and racist practices in the classroom and educational system that contribute to the normalized failures of dis/abled students of color. Also, this study builds upon the research of DSME scholars who call for increased collaboration between disabilities in education and mathematics in education communities to advocate for the needs of students with disabilities. I chose to initiate this study to understand the experiences of those who are multiply marginalized in my mathematics classroom.
**Representation.** This research primarily represents the ideas and realities of the study participants, dis/abled students of color. The interviews focus on describing, understanding, and interpreting their lived experiences learning mathematics in school. However, due to the intersubjective nature of the methodology, this research also represents my personal experiences as a student of color and as a mathematics educator whose students include dis/abled students of color.

**Benefits.** As this study was used to complete my doctoral degree, I benefited directly from this research. Furthermore, as a mathematics educator and researcher, I benefit from hearing the experiences of these students as they may inform my teaching and research practices. Other mathematics educators interested in creating a more equitable environment for their students also stand to benefit from the findings and implications of this study. The participants were paid to participate in this study. They also benefitted by participating in the sharing of their stories. The phenomenology approach promotes epistemic agency, affirmation, and healing through collective sharing (Andrews et al., 2019).

**Legitimation.** This study addresses the needs, interests, and concerns of mathematics educators and researchers attending to creating more equitable learning environments for students. By capturing the voices and experiences of dis/abled students of color as they name and resist ableist and racist processes, this study also addressed the needs of dis/abled students of color who are multiply marginalized within the educational system.

**Accountability.** While the study was accountable to the IRB, this study was ultimately accountable to the study’s participants whose voices and experiences grounded the findings and implications. Throughout the study, I ensured that the participants were included in validating the data and findings through various forms of member checks. These member checks are further
outlined later in this chapter. I wanted to ensure that the study accurately captured the participants’ descriptions of their experiences.

**Researcher Positionality**

This positionality statement provides for reflexivity. Through the process of reflexivity, I explained my “biases, dispositions, and assumptions that allow the reader to understand how I arrived at particular interpretations of the data” (Merriam, 2009, p. 219). Reflexivity accounts for the nearly impossible challenge of suspending my presuppositions, beliefs, values, or lived experience. However, throughout the research project, I made an intentional effort to be aware of those presuppositions, beliefs, values, positionality, and lived experiences, from design to data collection to data analysis. My positionality statement highlights the multidimensional identities that I carry as a researcher.

My lived experiences as a nondisabled, Iraqi-American, and Muslim student who grew up attending K–12 public schools in the post-9/11 United States; as a nondisabled mathematics classroom teacher working in a secondary public school; as a graduate student education attending a predominately White and elite private university; as an academic researcher studying mathematics education for students with dis/abilities; have shaped my beliefs, values, and understandings of this world and this study.

**Learning Mathematics as a Nondis/abled Student**

Learning mathematics was rarely an obstacle for me. Even when it was challenging, I enjoyed working through those challenges. I found purpose and validity in my success through doing well in mathematics. One of my earliest memories of this feeling came in second grade. My teachers and parents decided I was ready to skip first-grade, so I joined the second grade
during the academic school year. On my 1st day of second grade, the math teacher played a game with the students where students competed to recite math facts quickly.

When I defeated the student considered the brightest student in the class, I quickly gained recognition. From then on, I put immense effort into developing my math skills, such as memorizing the multiplication tables and making sure I was always the first to complete the timed multiplication tests. Later in school, I would get the highest scores on the exams. I took pride in my ability to understand mathematics and tutor my peers. And yet, despite my success in learning mathematics and joy in studying mathematics, I never thought to pursue mathematics after high school. Based on my experiences learning mathematics in a K–12 public classroom, the field of mathematics consisted of solving equations from a textbook and little else. I wanted to pursue a degree that would allow me to understand my community better and empower me to make positive changes. I did not understand at the time how mathematics would allow me to do that. At the time, I did not know what careers an individual who studied mathematics could pursue. And while I knew engineering and other STEM-related careers involved the study of mathematics, I did not see myself, a female person of color, as belonging in those industries. When I attended UCLA, fellow students often told me that if I chose to study any of the hard sciences such as engineering or physics, I would be the only female student in the classroom. As someone who highly values peer collaboration, I did not think I would be successful in a highly competitive, male-centered field in the hard sciences.

**Learning Mathematics as an Iraqi American, Muslim American Student**

The first time I met teachers, I either had to explain how to pronounce my name or let them butcher the pronunciation and deal with the fallout of snickering from my fellow students or teasing of nicknames that followed. When we returned to school in January, I had to explain
to teachers and students why I did not get any Christmas gifts. I had to explain why I was not eating food or drinking water during the month of Ramadan during lunchtime. Every day I struggled to embrace the role of cultural ambassador, explaining that “Arabia” is not a country, “Arabic” is a language, “Arab” is an ethnic group, “Iraq” is a country that is in the same region as the Pyramids of Egypt. When 9/11 happened during my ninth-grade year in high school, it became easier to embrace the role of the U.S. teenager and hide away the cultural baggage that came with being Iraqi-American or Muslim-American. At school and in the classroom, I’d try my best to follow the norms and fit into the traditional U.S. public school classroom expectations. I excelled at learning their history of European wars, U.S. settlement, and U.S. foreign policy. I read their literature written by White men about White men and taught by White men. I studied and memorized their mathematics with rules and procedures developed by White men and taught by White men. It was not until I entered college and took my first class on the history of Islam and the Middle East that I learned about the contributions of the Arab and Islamic world to the field of mathematics. Only then did I feel a sense of pride and ownership in knowing and studying mathematics.

Learning Mathematics as a Teacher

I did not want to replicate a mathematics experience I had growing up. I resisted any curriculum that would leave my students wondering about the relevance of mathematics to their lives and the world. I wanted them to understand that mathematics, like other fields of study, allows us to understand better the word—its built environment, patterns, and narratives. I also did not want to replicate the pedagogy I grew up with, where the teacher lectured to passive students taking notes from the board. I remember my best friend growing up struggling with this
instructional style and confessing that she never asked questions because she knew the teacher would perceive her as stupid for not following along.

As a teacher, I actively encouraged my students to ask questions. I provided multiple opportunities for students to collaborate with their peers to problem solve and explain to them in front of the class as the teacher. I made an intention to learn alongside my students, discovering from my students’ intuitive methods of problem solving and explaining their ideas. However, I continued to struggle with issues of status and equity in the classroom. The same students - mainly male, English dominant speaking, and nondisabled students - actively participated in the classroom, raising their hands to share their ideas and challenge their peers. I intentionally chose female students to present to the class to address this issue. I highlighted the contributions of historically marginalized students to the team collaboration by acknowledging how they visualized their thinking or asked questions. I attempted to position them as valuable members of the classroom community. When I asked my students to write their Dear Math letters at the beginning of the year, I would read about how my students often remained silent in math classrooms and were disregarded as slow, lazy, or not caring by their previous mathematics teachers. They described feelings of fear and hatred toward learning mathematics.

I successfully fought to detrack our mathematics program, convincing my school’s administration and math department to allow students with dis/abilities and students considered behind grade level into my classroom and learn alongside peers who are considered “accelerated” or “gifted.” This move to integrate my classroom challenged me to rethink the role of schooling in a neoliberal United States. Suppose exclusionary practices are justified in the K–12 school system in the name of providing specialized care for students. How can society combat the exclusionary practices in the post schooling experience? When will students of different
backgrounds and abilities ever have a conversation with one another, recognize the humanity in each other, or believe in the common struggle they have toward a fair and just society? K–12 schooling needs to model the democratic society we wish to live in rather than serve as a tool to provide rank and class workers.

When I initially challenged the segregationist practices at my school site, practices that justified sorting and placing students into separate learning environments based on their scores on a test, I met resistance from both educators and students. The educators were unsure how to teach a classroom with diverse learners, and the students had grown accustomed to learning in more homogeneous environments. Students placed in accelerated programs in their previous math classes confessed in their assigned written reflections that it took them time to realize their peers, who they often perceived as less able, had valuable contributions to solving the problem. Students who were previously placed in remedial or nonaccelerated mathematics courses admitted to feeling intimidated by their “smarter” peers and hesitating to ask for clarification or share their ideas. I realized how the school system positioned students as able and disabled, particularly in mathematics instruction. I recognized my role as a mathematics educator in contributing or dismantling such a system.

As a mathematics educator, I have witnessed how mathematics education marginalizes students with different abilities. Students are often siloed into remedial math courses, stigmatized into repeating mathematics courses, held back from achievement because of low scores, and framed through a deficit lens because they struggle to adapt within a system that privileges nondisabled individuals. I have also witnessed how disabled students have resisted these oppressive structures by finding ways to make visible their strengths and contributions to learning or refusing to participate in the ableist structures.
Learning Mathematics as a Researcher

Several years ago, I started my doctoral journey while still a mathematics classroom teacher. I remained a teacher because I wanted to preserve my teacher identity as I researched ways to make classrooms more equitable learning environments for all students. I had philosophical and pedagogical conflicts with some of my fellow educators, so I sought a doctoral degree to help me understand why and how to deal with this conflict. In this doctoral program, I learned about ableism and the interlocking forms of racism and ableism (Annamma et al., 2016). These concepts helped me understand what I witnessed as an educator. My White disabled students successfully navigated high school mathematics, using their status with an IEP to advocate for otherwise inaccessible resources.

In contrast, my dis/abled students of color were often burdened with the disability label. They were burdened with teachers’ lowered expectations, placement in remedial or support mathematics courses instead of enriching electives and responding to a system that viewed them as needing to be fixed. I began to rethink my experiences with my students and the problematic pedagogical practices and values that contributed to disabling my students. I think of one student who attempted to hide his dyslexia from the teachers and school. He loved math because it did not burden him with conveying his ideas through writing or reading, but he struggled to pass my class because I compelled all students to explain their process through problem write-ups. I think of another student who openly admitted that the emphasis on memorizing procedural, teacher-driven steps to solve a math problem in my classroom was a barrier to her success. My mathematics classroom environment privileged students who could memorize and follow steps and discriminated against students who thrived in learning environments that emphasized visual approaches and conceptual understanding. I think of another previous student who was born with
fetal alcohol syndrome. He finally felt successful in mathematics when we used tangrams and geoboards to explore geometric concepts of area and perimeter but struggled when I failed to provide manipulatives or visuals to conceptualize algebraic concepts of quadratic modeling.

As I continued to learn about the role of power and sociocultural theories (i.e., Collins, 2013; Esmonde, 2017b), I saw the ways the classroom environment could either enable or disable students. Yet, I struggled to find specific research that spoke to how mathematics education acts as a disabling mechanism for dis/abled students, and specifically dis/abled students of color. My White dis/abled students mostly found success in my class, yet my dis/abled students of color often earned low grades or had to repeat the course. The mathematics equity research rarely specifically calls out dismantling inequitable learning environments for dis/abled students of color. As a graduate assistant working with professors supporting elementary special educators teaching mathematics, I realized how the classroom environment could disable or enable dis/abled students. Students in these segregated classrooms mainly were students of color, primarily male, and all labeled with learning disabilities. Coaching the educators on pedagogical practices that valued multiple approaches to solving a problem, multiple tools to support student understanding, and connecting mathematics to students’ lives, I witnessed students who previously received very little mathematics instruction blossom into mathematical thinkers and doers. I participated in research with educators, with students, and where practical solutions supported directly the participants who provided immediate feedback. This is emancipatory research, research that uplifts instead of merely documenting tragedies in the classroom.
Social Locations

As I conducted this study, I was aware of the power and privilege that I hold that is impacted by the multiple social locations I occupy (Misawa, 2010). Rather than fixed identities, power and privilege are fluid concepts that are mediated by context.

In this study, I was aware of the power I held as a researcher and mathematics educator who was also somewhat older than the participants. I held a certain level of authority and expertise that might impact my relationships with the participants. I attempted to enter the interviews and research from a place of learning from participants. I also shared my own educational journey with participants, to build trust through mutually shared experiences. I identify as first-generation Iraqi-Muslim-American and experienced forces of marginalization in my own educational journey. I shared these experiences with participants.

As a nondisabled individual, I am aware that I carry an ableist perspective of reality that may counter the participants’ perspectives of their realities. I needed to respect their positions and perspectives by actively listening to their narratives and attending to the implicit biases that I hold. As a student who grew up attending public schools in the United States, I was often subjected to rote memorization of mathematics procedures, banking model of teaching, and standardized testing.

Study Sample

The following section outlines the selection criteria for the participants in this study and sampling procedures for recruiting participants to the study.

Selection Criteria

I chose participants for this study if they meet a particular set of requirements: self-identify as a person of color, have had an Individualized Educational Plan (IEP) during Grades
9–12, and have taken mathematics courses in high school. Initially, I considered requiring participants to have a high school diploma to address R (2): how do dis/abled students of color resist the normalizing process of racism and ableism in the mathematics classroom. I decided that having a high school diploma does not need to be a criterion for participating since dropping out of high school or pursuing a GED instead of a high school diploma could be interpreted as resistance.

**Sampling Procedures**

The study employed purposeful sampling to identify participants that met the criteria - dis/abled students of color. I created a recruitment flier (see Appendix B) that included the criteria to participate, the purpose of the study, commitment details, monetary incentive ($100), and a link to an online form. I asked participants to complete the online form to indicate their interest in the study. The form asked for information such as participants’ names, email addresses, gender, whether they attended a public high school, whether they had an Individualized Education Plan (IEP) in high school, their learning disability (if known), and whether they identified as a person of color.

I used multiple outreach services to post the recruitment flier for the study. I asked disability service centers at local postsecondary institutions that support dis/abled students to share the flier with their students. These postsecondary institutions included community colleges, private universities, and public universities. I also asked educators and counselors in my network to directly reach out to any former students who might fit the criteria to contact me if they were interested in participating in the study.

After posting the flier for 3 weeks, 25 individuals indicated an interest in participating in the study. Of those 25 participants that indicated their interest either through email or the form, I
tried to include more diverse voices in the participant pool. One potential participant, a student who identified as female, African American, and did not graduate high school, rejected the invitation to participate in the study because she, according to her former teacher and mentor, was intimidated by the prospect of being in a study. Another individual who identified as male and Mexican American showed initial interest and participated in the initial contact visit but later declined to participate due to schedule conflicts and lack of access to secure Wi-Fi internet. I excluded individuals who attended private schools, did not identify as a person of color, or did not have an Individualized Learning Plan in high school. This exclusion criterion narrowed down the pool of participants to seven who fit the criteria to participate in the study.

Seidman (2006) does not specify an exact quantity needed for a phenomenological study. Instead, the number of participants needs to be “sufficient” (p. 55) to reflect the range of participants that make up the population of dis/abled students of color that studied mathematics in high school in the United States. While all the seven participants were from the same geographic region in Southern California, they were of varying genders, ethnicities, socioeconomic status, and language acquisition. By the end of the study, six participants participated in all three interviews, one participant participated in two interviews. All were high school graduates, and all of them were currently attending either community college or a 4-year university at the time of the interviews.

The purpose of this in-depth phenomenological study is not to provide generalizable findings to apply to a broader population (Seidman, 2019). Instead, the aim of this study was to present the experience of the dis/abled students of color in compelling enough detail and depth that those who read this study can connect to the experience, learn how it is constituted, and deepen their understanding of what it means to learn mathematics as a dis/abled student of color.
(Siedman, 2019). For this reason, I was more concerned about selecting participants who fit the criteria, were interested in the purpose of the study, and were able to participate in the study.

Data Collection

In total, I collected approximately 15 hours of recorded interview data, seven education journey maps, and 56 comments on Jamboards. I conducted the interviews between April and May of 2021 using Zoom’s virtual meeting platform (see Figure 1). Throughout April, the individual interviews were scheduled during various time slots to accommodate participants’ schedules, including mornings, afternoon, evenings, weekdays, and weekends. I scheduled the group interviews 2 weeks apart on Sunday mornings for 90 minutes after confirming that this time fit all the participants’ schedules. Six of the seven participants participated in all three interviews. One of the participants, Dewey, missed the first group interview due to an unexpected schedule conflict but requested participation in the final group interview.

Figure 1

Data Collection Timeline

Following each interview, I uploaded the interviews to an online automated transcription service, Otter, to initially transcribe all audio-recorded interviews. I then listened to the
interviews multiple times to edit the transcriptions using a denaturalized transcription that focuses more on the content and substance of the interview (Oliver et al., 2005).

Participants also created visuals, Education Journey Maps (Annamma, 2019), during their interviews and posted comments through the online platform, Jamboard, on each other’s Journey Maps. These visuals were also saved and used for analysis or to help construct the participants’ counternarratives.

**Participants**

After posting the flier for three weeks, 25 individuals indicated an interest in participating in the study. Of those 25 participants that showed their interest either through email or the form, I tried to include more diverse voices in the participant pool. One potential participant, a student who identified as female, African American, and did not graduate high school, rejected the invitation to participate in the study because she, according to her former teacher and mentor, was intimidated by the prospect of being in a study. Another Mexican American male showed initial interest and participated in the initial contact visit but later could not participate due to schedule conflicts and lack of access to secure Wi-Fi. I narrowed down the pool to eight participants (see Table 2). I excluded individuals who attended private schools, did not identify as a person of color, or did not have an Individualized Learning Plan in high school. These exclusion criteria narrowed the pool of participants to seven who fit the requirements to participate in the study. Seidman (2006) does not specify an exact quantity needed for a phenomenological study. Instead, the number of participants needs to be “sufficient” (p. 55) to reflect the range of participants that make up the population of students of color with dis/abilities that studied mathematics in high school in the United States. While all seven participants were from the same geographic region—Western United States—they were of varying genders,
ethnicities, socioeconomic status, dis/ability category. All were high school graduates currently attending either community college or a 4-year university.

Table 2

Participants’ Demographics

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Age</th>
<th>Educational status</th>
<th>Dis/ability label</th>
<th>Race/Ethnicity</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJ</td>
<td>19</td>
<td>Community college</td>
<td>ADHD</td>
<td>Mexican American</td>
<td>Female</td>
</tr>
<tr>
<td>Kirby</td>
<td>22</td>
<td>Private university</td>
<td>Auditory processing disorder</td>
<td>Asian American</td>
<td>Female</td>
</tr>
<tr>
<td>James</td>
<td>20</td>
<td>Private university</td>
<td>Dyslexia</td>
<td>Asian American</td>
<td>Male</td>
</tr>
<tr>
<td>BB</td>
<td>21</td>
<td>Private university</td>
<td>Autism</td>
<td>Hispanic</td>
<td>Female</td>
</tr>
<tr>
<td>Ariel</td>
<td>19</td>
<td>Community college</td>
<td>Speech or language impairment</td>
<td>Hispanic</td>
<td>Female</td>
</tr>
<tr>
<td>Dewey</td>
<td>20</td>
<td>Private university</td>
<td>ADHD</td>
<td>Latinx</td>
<td>Genderfluid</td>
</tr>
<tr>
<td>Carina</td>
<td>23</td>
<td>Private university</td>
<td>Anxiety / depression</td>
<td>Asian American</td>
<td>Female</td>
</tr>
</tbody>
</table>

Three-Part Phenomenological Interviews

Each participant completed three virtual interviews (see Table 3) that lasted approximately 90 minutes. Due to COVID-19 restrictions, I could not conduct the interviews in person. The three-part interview helped establish mutual trust and respect between the researcher and participant and among the participants. Each interview builds upon the other, providing a “cumulative effect” (Seidman, 2019, p. 25). Each interview had a specific focus and purpose that informed the following interview’s purpose. The interviews were spaced 2 weeks apart and
consisted of: (a) an initial individual interview with each participant to understand participants’ individual histories, (b) a follow-up focus group that focused on the experiences of learning mathematics, and (c) a culminating final focus group that focused on unpacking the meaning of their experiences described during the previous interviews.
### Table 3

*Participants’ Interview Dates*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Interview 1</th>
<th>Interview 2</th>
<th>Interview 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirby</td>
<td>April 25, 2021</td>
<td>May 16, 2021</td>
<td>May 30, 2021</td>
</tr>
<tr>
<td>James</td>
<td>April 25, 2021</td>
<td>May 16, 2021</td>
<td>May 30, 2021</td>
</tr>
<tr>
<td>BB</td>
<td>April 21, 2021</td>
<td>May 16, 2021</td>
<td>May 30, 2021</td>
</tr>
<tr>
<td>Ariel</td>
<td>May 7, 2021</td>
<td>May 16, 2021</td>
<td>May 30, 2021</td>
</tr>
<tr>
<td>Dewey</td>
<td>April 26, 2021</td>
<td>Did not attend</td>
<td>May 30, 2021</td>
</tr>
<tr>
<td>Carina</td>
<td>May 13, 2021</td>
<td>May 16, 2021</td>
<td>May 30, 2021</td>
</tr>
</tbody>
</table>

### Initial Contact Visit

Before participating in the interviews, the participants attended a group contact visit orientation where I introduced myself, the purpose of the study, the commitments of participating, and the purpose of each interview. The contact visit also initiated the process of informed consent (Seidman, 2019). Participants were allowed to keep their videos off during the interviews and orientations. They also used a pseudonym to ensure their information remained private throughout the interviews. Finally, the initial contact visit provided an opportunity to share the Education Journey Prompt that participants would complete and discuss during their first interview. I read the prompt aloud, explained the purpose of the Education Journey Map, and showed an example from another study (Annamma, 2017).

### Interview 1: Focused Life History

In phenomenological interviewing, the first interview is focused on putting the experience in the context of the participants’ life history (Siedman, 2019). During the first interview, I met with the participants individually over Zoom’s virtual meeting platform. The
focus of the first interview was to collect information about the participants’ educational histories that contributed to how they understand their relationships with mathematics today and how they interpreted the normalizing forces of racism and ableism in their lives as students. The interview consisted of creating and describing their education journey maps (see Appendix A).

**The Education Journey Maps.** Every participant completed an Education Journey Map (EJM) during their initial, individual interview. The Education Journey Maps (Annamma, 2017; Sirin & Fine, 2007) provided visual content of the students’ educational journeys without relying on verbal or written expressions. Written expression was still accepted in the Education Journey Maps. Participants were able to choose whichever modality they felt comfortable using to create their Education Journey Maps. The EJMs made visible how students experienced their education, the barriers they faced, and the enablers that helped them through their K–12 mathematics education journey (see Figure 2). The purpose of the Education Journey Maps (EJMs) is not just to act as a drawing activity but to serve as a “humanizing methodology” (Annamma, 2017, p. 4) constructed with purpose and rigor.
Here is the prompt of the Education Journey Map I used in the study as adapted from Siuty and Beneke (2020, p. 33):

Map your education journey from when you started school to now. Include interactions, conversations, people, places, obstacles, and opportunities on the way. Draw your relationship with learning mathematics in school. You can include what works for you and/or what doesn’t. You can include what felt comfortable and/or what didn’t. What stood in your way, and what helped you be successful? You can use different colors to show different feelings, use symbols like lines and arrows or words. These are just suggestions. Be as creative as you like and, if you don’t want to draw, you can make more of a flowchart. Afterward, you will get a chance to explain it to me.

I kept the prompt purposefully broad and written in a way that reminded participants that their EJM visual did not need to indicate spatial relationships or even be in a map form. Aside
from the prompt, the other concrete elements of the EJM as a data collection tool included: “creating continual access, providing genuine reciprocation, articulating complex positionality, and expressing authentic gratitude” (Annamma, 2017, p. 4).

To allow for continual access to the prompt, I shared the prompt at multiple points in the study with the participants. They first saw the prompt for the EJM during the orientation contact visit and were later emailed the Education Journey Prompt about a week before the actual interview. While I let them know during the initial contact that they would have time to create the Education Journey Map during the interview, I also let them know they could create it beforehand. All participants used the 25 minutes to complete their Education Journey Map during the interview.

I informed the participants that they could use any medium to create their journey map: on paper, and then email me a photo of their Journey Map; the online software Jamboard; digital drawing software on their electronic device; or a bullet point list on their word processing software. As participants created their EJMs, I left the prompt up on the shared Zoom screen so that participants could refer to it if needed. The Education Journey Map provided a starting point for participants to tell their stories about their k-12 learning experiences that shaped their mathematics experiences in high school as a student of color and as a disabled student.

**Sharing Education Journey Maps.** After the participants created their Educational Journey Maps, they shared their Educational Journey Map with me. They explained what they chose to include in their Journey Map. As the participants shared the experiences in the Journey Map, I probed them to tell me more details about the experience. For example, if they said they hated their middle math teacher, I asked them to describe a specific experience that led them to feel that way toward their teacher. Throughout the interview, I asked probing questions that
allowed the participant to reconstruct and narrate details of their context and life history. By asking “how” questions instead of “why” questions, I encouraged participants to provide concrete details of their life history that are more descriptive than interpretive (Van Manen, 2016).

I also asked follow-up questions (see Appendix A) regarding how they experienced learning as a disabled student or as a student of color if those identities were not already explicitly mentioned during their share out of their Education Journey Maps. For example, I asked, “Did your disability have an impact on your mathematical learning in school? If so, give an example. If not, tell me why your disability remained separate from your mathematical learning.” Similarly, I asked them, “Did your race or ethnicity have an impact on your mathematical learning in school? If so, give an example and if not, tell me why.” I limited the prepared questions to ensure participants led in their storytelling. My role remained limited to asking for more details or descriptions of their experiences. However, the prepared questions provided a structure to the interview and ensured that it stayed on their educational background and mathematical experiences in their K–12 schooling.

The first interviews with participants were roughly 90 minutes long. The semi structured interview format of the first interview allowed for dialogue, relationship building, and storytelling between the participant and me, the researcher. This reciprocity during the first interview set the groundwork for participants to feel comfortable participating and sharing their stories with others during the second interview - the focus group.

To “provide genuine reciprocation” (Annamma, 2017, p. 5), I also created and shared my EJM during each of the initial interviews. The sharing of my experiences allowed me to indicate areas and experiences where I overlapped with them, but more importantly, where my
experiences did not overlap. I did not have a diagnosed dis/ability in high school. I wanted to make explicit society’s positioning of identities that lead to “power imbalances” (Annamma, 2018, p. 24) present in this study between the participants and me, the researcher and mathematics educator.

Although I cannot eliminate those power imbalances, it was essential to provide a space to discuss those inequities and the ways that our stories both overlapped and differed. Sharing my education journey map disrupted the traditional stance of the researcher as detached, distanced, separated to maintain objectivity (Berryman et al., 2013). By sharing my story and listening to theirs, I worked toward building relationships with the participants, sharing concerns and benefits from this study, and collaborating on generating themes and knowledge. By creating and sharing my own Educational Journey Map, I also attempted to “limit the gaze” (Annamma, 2018) on the participant who may feel watched (objectified) during the creation process. It communicated that I have a story to tell worth discussion and not to be told by others as a researcher. I provided space for the participants to ask me or comment on my Education Journey Map. Finally, by creating and sharing my Educational Journey Map, I worked toward building trust with the participants by sharing my positionality and interactions with the school system as a non-dis/abled person of color.

At the closing of the individual first interviews, I asked participants what norms or structures they needed to ensure they felt safe and comfortable sharing their EJMs with the group and participating. All participants indicated that they were comfortable sharing their maps with others. However, one participant, Mark, was sensitive to others knowing his ability status. He needed reassurance on ensuring that his name and identity would not be shared with others
during the group interviews. I reminded participants to keep their cameras off and enter the Zoom space using pseudonyms.

**Interview 2: Cartographer’s Clinic Focus Group**

The purpose of the first focus group with all the participants was to focus on the specific experience of learning mathematics as a disabled student of color. The participants shared their education journey maps they created during the first individual in a virtual “cartographer’s clinic” (Anamma, 2019). The participants came together to participate in semi structured group interviews to identify and discuss salient themes in each other’s stories.

I decided to do a group interview for the second and third interviews for several reasons. First, the group interview would be an opportunity for participants to share their experiences with others. During their first interview, some of the participants indicated that they had never disclosed their experiences learning in school to anyone else. Second, by listening to others share their experiences, some participants recalled memories or descriptions of events they otherwise did not mention during the first interview. Finally, by sharing the experiences in a group setting, the participants member checked each other by indicating whether that experience resonated with their own or was different from their personal life experience.

The focus group served as a collaborative analysis. As participants shared their descriptions of their experiences, the other participants commented on whether the descriptions resonated with their own lived experiences. The themes were then co-constructed among participants where they “examined, articulated, reinterpreted, omitted, added, or reformulated” the themes together (Van Manen, 1994, p. 106). For example, a salient theme during the second interview was the role of mathematics teachers. Participants shared various ways mathematics educators limited their access and conveyed whether they had similar or differing experiences.
As participants entered the Zoom platform to start the focus group, I placed them in individual breakout rooms to rename themselves with their pseudonyms and turn their cameras off. I shared with participants that the purpose of today’s focus was to speak on the specific experience of learning mathematics as a disabled student of color. I also reviewed the discussion norms to ground the conversation and ensure that each participant’s voice felt valued:

- There is no right or wrong answer. All ideas and stories are valuable.
- Show respect for differing ideas, thoughts, and values.
- Honor the time limit.
- Speak clearly into the mic.
- Speak from the heart and listen from the heart.

We then began the virtual Cartographer’s Clinic, where participants did a silent virtual gallery walk. Their Educational Journey Maps were posted on their slide using the Jamboard Software (see Figure 3). The participants were asked to post a virtual sticky note that responded to one or all these prompts:

- Themes: What are the similarities you see?
- Outlier: What stands out? What is different? Remember to be an outlier. It takes courage to say something. It may be something we are all thinking about, but many of us were too scared to say.
Participants had 20 minutes to respond to each or any education journey maps. Some chose to respond to all of the journey maps, while others chose to respond to only two of the journey maps. I did not specify how many comments or how many of the maps need to be completed.

After the participants had time to look through and comment on the Education Journey Maps, I asked participants to share what stood out to them and any initial reactions they had after looking through each other’s Journey Maps. Following that short discussion that lasted approximately 10 minutes, I invited each participant to share a salient memory or experience learning mathematics as a student of color with a disability. To get them into that frame of mind
to share, I did a guided recall that included prompts to remind them of their experiences learning mathematics in high school:

I want you to think back to high school. Think of a memory, an experience that stands out for you when you think back on learning mathematics in high school. What was it like being in your math class and carrying the label of a student of color, of a student with a disability, of a student of color with a disability? Were there experiences as you were learning that were comfortable or uncomfortable? Were there experiences of failure or success? What is it like walking through the door of the classroom, seeing your teacher, sitting at your desk, what was it like interacting with the teacher, the other students, the learning activity, did you work in groups? Did you work alone? What was that like? Did you listen to lectures from the teachers? Did you learn from a textbook? A handout? What did that feel like? Did you get accommodations in class? Outside of class? What was that like? What was it like taking a quiz or taking a test? Asking for help? Asking questions? Answering questions? Offering help to others? What was it like to receive help? Did you feel like you belonged? Did you feel like you were being ignored or watched? Rewarded or punished? Did you feel like you were a valuable part of the classroom? Did you learn? What were the challenges you faced? How did you overcome those challenges? Were there times when your identity came up? Were you aware of your identity?

Then each participant individually shared their story and experiences learning mathematics based on their Education Journey Maps. Following each story, participants responded to the shared story by asking probing or clarifying questions, sharing connections to their own lives, or commenting on what they loved about what was shared. I facilitated the
discussion by calling the participants to share their stories and reading any comments posted in the Zoom chat. One participant, Ariel, was notably silent throughout the focus group, so I privately chatted with her through the Zoom application to be ready to share her story and to check in if there was anything I could do to create space for her to share.

After 90 minutes in the focus group and each participant had shared their stories, I closed the interview. I reminded them that we would be meeting in 2 weeks as a group for the final interview. I explained that the final interview focused on making meaning of the experience and potentially generating solutions to the problems and dilemmas posed during the second interview. I reminded them that their voices are not often heard or centered in mathematics education research. As such, to take the next two weeks to reflect on recommendations, lessons, or insights for teaching and learning mathematics.

**Interview 3: Meaning-Making**

The third and final interview served as space for collaborative analysis and meaning making of their mathematics experiences as dis/abled students of color. Before the interview, I did some initial thematic analysis of the interview transcripts and individual interviews between the second and third interviews by identifying salient quotes and descriptions that resonated with the research questions.

During the third and final interview, I asked participants to reflect on the meaning of their experiences learning mathematics as a dis/abled student of color (Siedman, 2019). I prepared another Jamboard and started the interview in a similar format as the second interview with a silent chalk talk. However, instead of posting their Education Journey Maps, I posted anonymous quotes from the interviews that I found significant toward the studies’ purpose. I posted the following quotes:
• “I was already the black sheep or like the ‘outsider’ in high school, so, of course, I did not want anyone to know that I have this accommodation, or I have this disability. I didn’t want people to see me as broken. They already see me as an outsider. I didn’t want anybody to see me any worse.”

• “I would learn the math at home, and then in class be anxious for 90 minutes three times a week trying to figure out how to talk to people. It felt like I was stepping into an environment that was designed to be comfortable for other people at my expense. Like, I had to be uncomfortable so that other people in the class wouldn’t have to be.”

• “Sometimes teachers thought that (since) I was doing good in class, it (was) like ‘Why do you need all these extra accommodations and stuff?’”

• “I had a teacher who would mark your homework or tests wrong if you did a problem in a different way than they showed it. But you still got the right answer . . . I went and looked for a way of doing things that made more sense to me, but I had to pretend like I was doing it the way the teacher showed me, or I wouldn’t get full credit.”

• “A lot of times (my peers) would say, “Oh my gosh, you’re so lucky, you get to go take your test somewhere else . . . Oh my gosh, you get extra time?”

• “We’re supposed to take a quiz and part of my accommodations is to take them in a separate area and have extra time. I told my teacher ‘Hey, can I go take my quiz in the office or whatever.’ And he was like ‘Do you really need to take the quiz over there?’ and I was like ‘Well, that’s what my accommodations are.’ And he’s like, ‘It’s not that long. You can just stay here and take it with everyone else.’ He said it in front of other people too.”
• (I would hear them say) “Oh, you’re just misbehaving. You don’t want to try. You’re lazy.”

After reviewing the norms and agenda for the group interview, I invited the participants to post comments on the Jamboard. I provided sample sentence starters such as “This is significant because . . .” “I notice . . .” “I have a question about . . .” and “To me this means . . .”

I initially provided 15 minutes for the participants to look through and comment on as many quotes as they wanted. I gave them another 10 minutes as participants indicated that they needed more time over the Zoom chat. The silent chalk talk on Jamboard allowed participants to find similarities in their experiences. For example, one participant commented, “Even if you aren’t already the black sheep, that feeling of isolation is real . . . I’m so sorry others experience this as acutely as I do.” At the same time, others commented on how the experience was different for them than as described in the quote. For example, one participant commented, “Can’t relate thankfully [sic].” Others posed questions such as, such as, “Why is working through problems in a different way than instructors taught not a good practice?” (see Figure 4).
Following the silent chalk talk on the Jamboard, I asked participants to expand on the comments they posted. For example, I asked the participants to comment on the question a participant posted, “Why is that the automatic thought people have?” in response to the quote, “Oh, you’re just misbehaving. You don’t want to try. You’re lazy.” I spent the next third of the interview unpacking the comments posted during the chalk talk and providing space and opportunities for different participants to respond. I used the private chat in Zoom to encourage participants to share or step back if they were taking up too little or too much space in the discussion.

The third interview was the last time I would meet with the participants in a structured setting. I let them know that I would still send them themes and quotes that I would like to check were accurate to their voice and experience. As this was the last interview where I could directly
ask questions and gain an accurate account of their experiences, I also prepared questions that came up while I did the initial thematic analysis of the initial two interviews. I still maintained the semi-structured interview format as the previous second interview, as I want to keep the focus group open and free-flowing for anyone to share and for ideas and comments to build off one another. Here are the prepared questions that I asked during the final interview:

- Relistening to the interviews, the focus group from last week, and the individual interviews, I did not hear experiences where your abilities, talents, or identities were valued in the classroom

  1. Is that accurate? For everyone here? If so, what do you think that means? Why does that matter? What is the significance?

  2. Where or when did you feel you were valued for those who are not accurate? How so?

- Several of you described experiences when you were embarrassed to have the label of a learning disability or receive accommodations, or when peers would find out that you get extra time on a test or take the quiz in a separate learning space. Why? What does it matter?

  The third interview served as a collaborative thematic analysis where the participants shared their thoughts of the significance of the meaning of a particular experience, and the other participants either agreed or disagreed with how that meaning aligned with their own experiences (Van Manen, 1990).

  I ended the final interview by asking participants if they had any specific advice for teachers and advice for students. I also asked if there were any questions they wanted to ask the group that I did not ask.
To center their voices and experiences, I grounded the interviews in their experiences and narratives from the Education Journey Maps to direct quotes and questions they posed to the group. Grounding the interviews in their stories and voices was my attempt to express genuine gratitude for sharing their experiences. While some of them shared experiences of joy in learning mathematics, they all shared difficult experiences of shame, embarrassment, and rejection in their schooling that they still carry with them today. I expressed gratitude for this sharing by genuinely responding, by “listening and speaking, which created a dialogic spiral” (Annamma, 2018, p. 26) that worked to build trust among participants and between participants and researchers.

**Removing Barriers to Participation for Individuals During the Interview.** I made several attempts to eliminate barriers that might limit participation during the interview setting. I made sure to read aloud the prompts multiple times and ensured participants that they could audibly share their comments to the quotes if they did not feel comfortable writing their responses. The silent chalk talk also provided an opportunity for participants who did not feel comfortable sharing aloud to share on the online Jamboard or Zoom platforms. They could also use the Zoom chat feature to type out their responses or questions to the group instead of going on the mic. Participants also used the private chat feature on Zoom to let me know if they needed to take a break, step away, or want to speak.

I turned on the Zoom closed captioning service to transcribe the audio share out. One of the participants asked for this feature as she was recently diagnosed as hard of hearing in addition to a learning dis/ability. Finally, the Education Journey Map provided a different medium, a visual, for participants to share. Rather than rely on a singular modality of sharing their experiences, such as collecting oral responses alone. The Education Journey Maps allowed
participants to visually convey their experiences learning mathematics as a student of color with a disability.

Reflexivity Journal

I used a reflexivity journal throughout the data collection and data analysis to document where I was in conversation with the data (Birks & Mills, 2014). Phenomenology requires that researchers think about their thinking to address issues of intersubjectivity in the research project (Giorgi, 2002). While critical phenomenology values intersubjectivity over subjectivity (Guenther, 2020), I kept the reflexivity journal to ensure that I was listening to the participants’ descriptions with an awareness of my own personal biases. Before and after each interview, I journaled using the following prompts (Berryman et al., 2013):

- How was the research initiated?
- How do I mediate the power and control in this dynamic?
- Who benefits from the research?
- Whose needs, interests, and concerns does this research represent?
- Accountability: To whom am I accountable?
- What must I unlearn from my position of privilege with the current structure to invent new ways of approaching more ethical and socially just research?

The frequent revisiting of these prompts reminded me of my stance as a researcher with the participants in maintaining my role as a learner in this research study. I captured any biases or preunderstandings I had about the participants and the experiences they shared. I kept both a physical journal to record my thoughts and a digital file as I feel both mediums allow me to journal my thoughts differently. In the physical journal that I kept, I took notes during the interviews of what stood out to me and how I felt during the interview, and my initial
impressions of the participant’s experiences. I used the digital journal to capture my analytic memos that emerged as I analyzed the data. I used the following prompts for my analytic memos (Saldana, 2009):

- How I relate to the participants and the phenomenon
- The research questions
- Operational definitions of the emerging themes
- Connections to existing theories or studies
- Emerging patterns or themes
- Problems with the study
- Personal and ethical dilemmas I encountered with the study
- Future directions with the study (p. 40).

The reflexivity journal allowed me to recognize any biases I may hold toward the interpretation of the data that might impact the data interpretation. As I revisited the memos, I wrote during the data collection and thematic analysis process, I understood why my past self asked specific questions during the interview or found particular quotes from participants meaningful. Revisiting the memos was helpful if any disconfirming data arose (Saldana, 2009).

Data Analysis

The thematic analysis process searches for “structures of meaning” (Van Manen, 2014, p. 319) that emerge from participants’ descriptions of their experiences. Rather than a rule-bound coding process, thematic analysis is a “free act of seeing meaning” in the text (Van Manen, 2014, p. 319).
Transcribing

Transcribing the interviews allowed me an opportunity to immerse myself in the data. I began the transcription process between the first and second interviews. I began the transcription process by uploading the interviews into an online software that could auto-transcribe the interviews. I then relistened to the interviews and edited the transcriptions using a denaturalized approach, editing typos, spelling errors, and removing filler words such as “um,” “uh,” and “like” (Oliver et al., 2005). The denaturalized transcriptions focused on the substance of the participants’ descriptions. During the transcription, I also removed any personally identifying information, such as names of individuals and schools.

Thematization

To begin the thematic analysis, I combined all the descriptions of experiences - the anecdotes - for each participant across all three interviews into a single document. Van Manen (2014) argues that the anecdote as a narrative device is a powerful example in explaining things by bringing in details, vividness, and the presence of an experience. I edited the full transcripts of the participants into anecdotes that best captured the participants’ experiences learning mathematics as a student of color with a dis/ability. I was cautious not to overwrite, change, or distort the text in a way that would alter the meaning of the text. In Table 4, I show an example of a description a participant described as their worst mathematical learning experience in original form and then edited into an anecdote.


Table 4

Sample Transcript Editing Into Anecdote

<table>
<thead>
<tr>
<th>Original text transcript</th>
<th>Edited into an anecdote</th>
</tr>
</thead>
<tbody>
<tr>
<td>My freshman year, probably, we’re taking finals. Um, like, the first semester. It wasn’t, it was either the first or second semester I was, I know that it was finals, like, during my freshman year. Um, what’s it called, um, but I remember like, because since I got extra time to do the finals, I had spent like, it was, I was doing my last one for like, three hours, like four hours, something like that. And I was like, doing it. And I was literally sitting there like, trying, like, so hard and like doing everything. And then like, um, and then I was okay, like, I probably at least got like a C on it. Like, maybe I could, like, I’ll not get like a D as my final grade. This is a nine. And like, I ended up seeing my grade a couple days later, and I completely like failed it. And like, I was like, do like, I was just so upset, because like, I actually tried like, so hard. And like, I still failed. Like, and I still got a D is my final grade like, so. Yeah, that was like, That was horrible. Well, like because I had already like, not like, I had already like, had bad experiences before that. But like, once like, like, that happened, I was just like, dude, like, literally, why do I even need to like, why do I even try? Like if I like if when I do try, like it does not change anything? Like I don’t try I fail I try and I still fail. So like, it was just like, do like there’s really no point of me doing this. Like, I’m just going to fail up regardless. So yeah.</td>
<td></td>
</tr>
<tr>
<td>My freshmen year, I got extra time to do the final. I ended up spending three to four hours on the test. I was literally sitting there, trying so hard and doing everything. And then, after, I was like, “Okay, I probably at least got a C on it. Maybe I won’t get a D as my final grade.” I ended up seeing my grade a couple days later, and I completely failed it. I was just so upset, because I actually tried so hard. And I still failed. I still got a D in my final grade. I had already had bad experiences before that. Why do I even try? Even when I do try it does not change anything? I don’t try, I fail; I try and I still fail. There’s really no point in me doing this. I’m just going to fail regardless.”</td>
<td></td>
</tr>
</tbody>
</table>

To lay the groundwork for the analytic thematic coding, I read through and created descriptive codes for the data collected. Descriptive coding summarizes the main topic of a
passage of data, focusing on identifying the topic and not the content of what is said (Saldana, 2009). I identified the following 33 descriptive codes (see Table 5).

**Table 5**

*Descriptive Codes*

<table>
<thead>
<tr>
<th>Treatment by teachers</th>
<th>Tracking</th>
<th>Teacher Attitude</th>
<th>Taking an assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support class</td>
<td>Showing work</td>
<td>School authority</td>
<td>Repeating math course</td>
</tr>
<tr>
<td>Racism</td>
<td>Race</td>
<td>Effort</td>
<td>Push Out</td>
</tr>
<tr>
<td>Private Tutor</td>
<td>Peers</td>
<td>Parent Advocacy</td>
<td>Learning disability</td>
</tr>
<tr>
<td>Internalized ableism</td>
<td>Instruction</td>
<td>Hiding</td>
<td>Group Work</td>
</tr>
<tr>
<td>Grades</td>
<td>Getting an IEP</td>
<td>Feelings toward math learning</td>
<td>Learning environment</td>
</tr>
<tr>
<td>Doing math</td>
<td>Curriculum</td>
<td>Curiosity</td>
<td>Confidence</td>
</tr>
<tr>
<td>Choice</td>
<td>Asking questions</td>
<td>Accommodations</td>
<td>Helping</td>
</tr>
</tbody>
</table>

I then continued to search for meaning in their descriptions by looking at the text through at different levels: the whole text, selective reading, and then detailed reading (Van Manen, 2014). Figure 5 illustrates the process of thematic analysis from whole text to selective reading to detailed reading.
During the whole text reading, I read the entire anecdote. I then wrote a memo on the question, “How can the meaning or main significance of this text as a whole be captured as it relates to learning mathematics as a student of color with a dis/ability?” For example, with the passage in the Figure 5, an overall theme for the entire anecdote can be that the mathematics assessment is set up for the student’s failure, regardless of the student’s effort.

Then, with the same anecdote, I read and reread it several times and identified specific statements or phrases that were particularly revealing about the experience of learning mathematics. For example, the phrase that stood out is “I still failed” and “I’m going to fail regardless.” This participant described throughout the interview history of struggling with mathematics. Despite a renewed sense of effort to try on the mathematics exam in ninth grade and accommodations for a learning disability, the student still failed the assessment. The experience of learning mathematics is one of the repeated failures for this participant.

Finally, I did a detailed reading, where I looked at every single sentence or cluster of sentences and asked, “What does this sentence reveal about the experience of learning
mathematics as a disabled student of color?” Table 6 shows an example of the same passage using sentence-by-sentence thematic analysis.

**Table 6**

*Sentence by Sentence Thematic Analysis*

<table>
<thead>
<tr>
<th>Sentence</th>
<th>What does this sentence say about the experience of learning mathematics as a disabled student of color?</th>
</tr>
</thead>
<tbody>
<tr>
<td>My freshmen year, I got extra time to do the final.</td>
<td>Learning mathematics requires extra time, an accommodation not afforded to all.</td>
</tr>
<tr>
<td>I ended up spending three to four hours on the test.</td>
<td>Learning mathematics takes a lot of time.</td>
</tr>
<tr>
<td>I was literally sitting there, trying so hard and doing everything</td>
<td>Effort is experienced as sitting and focusing mentally on a mathematics assignment.</td>
</tr>
<tr>
<td>And then, after, I was like, “Okay, I probably at least got a C on it. Maybe I won’t get a D as my final grade.”</td>
<td>Success in learning is experienced through earning grades (property). Expectation of reward through grade. The grade is the reward / punishment.</td>
</tr>
<tr>
<td>I ended up seeing my grade a couple of days later, and I completely failed it.</td>
<td>Failure in learning is perceived through grades.</td>
</tr>
<tr>
<td>I was just so upset because I actually tried so hard.</td>
<td>Realization that putting in effort without an expected reward (positive grade)</td>
</tr>
<tr>
<td>And I still failed. I still got a D in my final grade.</td>
<td>A D grade is considered failing. Failing at learning mathematics is based on the grade given.</td>
</tr>
<tr>
<td>I had already had bad experiences before that.</td>
<td>Learning mathematics is a cumulation of negative experiences.</td>
</tr>
<tr>
<td>Why do I even try?</td>
<td>Hopeless endeavor.</td>
</tr>
<tr>
<td>Even when I do try it does not change anything?</td>
<td>Trying is only to change the grade.</td>
</tr>
<tr>
<td>I don’t try, I fail; I try and I still fail.</td>
<td>Learning mathematics is always a failure, despite the accommodations and effort.</td>
</tr>
<tr>
<td>There’s really no point in me doing this. I’m just going to fail regardless.</td>
<td>Loss of agency or belief that will succeed. No motivation.</td>
</tr>
</tbody>
</table>
Counter-stories

Counter-stories are a method of telling the stories of people whose experiences often go unheard; it is a tool for “exposing, analyzing, and challenging majoritarian stories of racial privilege” (Solórzano & Yasso, 2002, p. 8). I compiled the counter-stories from member-checked anecdotes collected from all three interviews, my own professional experiences as a secondary mathematics educator, and the existing literature. Compiling the counter-stories in this way accounts for the intersubjectivity of critical phenomenological methods (Guenther, 2020) and theoretical sensitivity (Strauss & Corbin, 1990) I have to this topic. The single case analysis presented as counter-stories center the unique experiences and perspectives of each of the participants.

Dis/abled students of color are not a monolithic group. The Individuals with Disabilities Education Act (IDEA) recognizes 10 types of disabilities (National Center for Education Statistics [NCES], 2021), and eight races or ethnicities are recognized in the United States (U.S. Census Bureau, 2020). Multiply marginalized individuals carry unique and valuable perspectives and ways of knowing that often go unheard (Annamma et al., 2016). The counter-stories of their lived experiences serve as important sites of knowledge production that resist hegemonic representations, particularly representations that tend to “valorize individuals, groups, and bodies of knowledge deemed ‘normal’ and marginalize those deemed the ‘other’” (Ferri, 2010, p. 140). The counter-stories presented in this study attempt to name and disrupt the “multiple axes of marginalization” (Annamma & Morrison, 2018, p. 125) dis/abled students of color face in learning mathematics. Counter-stories served several functions in this study: (1) building community among dis/abled students of color by “putting a human and familiar face to
educational theory and practice”; (2) showing those at the margins that they are not alone in their position and experiences; (3) challenging normative belief systems about mathematical learning and teaching (Solórzano & Yosso, 2002, p. 36).

I shared several of the counter-stories with other disability scholars, scholars with disabilities, and scholars with disabled family members. They read through the stories to address any ableist perspectives that might be present in the constructed narratives.

Cross-Case Analysis

Following the single-case analysis, I identified themes across all the participants’ descriptions and presented them as a cross-case analysis. The themes were organized according to how they addressed the research questions of the study: (R1) how do dis/abled students of color interpret being raced and disabled in the mathematics learning environment and (R2) how do dis/abled students of color resist the normalizing process of racism and ableism in the mathematics classroom? More specifically, the findings for the first research question were organized according to an existing theoretical framework: pedagogy of pathologization (Annamma, 2018). The findings for the second research question were organized to the forms of resistance framework found in the work of Solórzano and Bernal (2001).

Validity and Reliability

Member Checking

Member checking ensures validity and minimizes data findings and interpretation (Lincoln & Guba, 1985). I member checked the data and analysis in several ways. First, the group interviews acted as member checking, as the participants confirmed or disconfirmed experiences and initial themes that other participants shared. I posted salient quotes (see Appendix C) from the previous interviews and invited participants to discuss the meaning,
significance, and connections to those quotes. I also asked participants to comment on initial themes from previous interviews, such as the stigmatizing label of “the dis/abled student” and how their identities were not valued in the classroom.

I also member checked the data by emailing participants their edited transcripts. After I edited the transcripts into key anecdotes, I emailed each participant a form to verify their edited transcripts’ accuracy. The form also allowed participants to provide further clarification or descriptions of their experiences. Four of the seven participants responded to the member check form. I also let participants know that I can meet over Zoom to listen to their feedback if typing out their responses is not preferred. I sent several reminder emails and allowed participants several weeks to respond, with accommodations if participants requested more time.

I wrestled with the decision of whether to send participants their compiled counter-stories. I wanted to attend to the culturally responsive methodology tenet that study remain accountable to the participants of this study and ensure that the participants, not me – the “expert researcher” (p. 5) remain the “purveyor of their truths” (Berryman et al., 2013, p.5). For this reason, I recognized the potential positives in sharing their compiled counter-story with participants. The counter-stories were based on their member-checked anecdotes and included lengthy quotes from their interviews. Their quotes were shared and checked by most of the participants. However, the counter-stories were framed to address the research aims of this study: interpretations of ableism and racism in their educational journeys as well as their resistance to these normative forces.

For several reasons, I decided not to send the participants their compiled counter-stories. I was concerned about excessively burdening the participants with repeated follow up requests to review the findings, a concern brought up in another study (Goldblatt et al., 2010). I also was
concerned that the relationship I had forged with participants would influence whether the participants would agree with their representation as a means of “pleasing” me, the researcher (Goldblatt et al., 2010, p. 393). Due to the nature of the study and the means through which the participants were recruited to this study, I did not have a close relationship with the participants where they may feel comfortable challenging the connections I made between their experiences and existing theoretical frameworks. Finally, I was concerned about the impact that reading their counter-stories may re-traumatize them. During the interviews, they shared that this was the first time disclosing their experiences or identities as a dis/abled student to anyone. While they felt safe sharing their experiences in an anonymous space during the data collection process of the study, I was concerned that sharing their printed counter-stories nearly a year after their participation might trigger negative feelings.

**Data Saturation**

The three-interview structure of the data collection allowed for data saturation (Seidman, 2006). During data collection, the data and emerging findings felt saturated as I was hearing the same things repeatedly and no new information surfaced as I collected the data (Merriam, 2009). Between Interviews 1 and 2, new information and data emerged as participants shared uncovered memories during their second interview that were triggered from listening to each other’s responses. However, by Interview 3, no new information or themes emerged. Rather, interview three solidified the themes that emerged during Interviews 1 and 2. Over the course of several weeks, participants had multiple opportunities to describe, understand, and make meaning of their experiences learning mathematics. This allowed participants to check for “internal consistency” (Seidman, 2006) of their descriptions, contributing to the validity of the data collection.
Reliability

Reliability attends to the ability of another researcher replication the findings of this study. What is studied in the human behavior is “in flux, multifaceted, and highly contextual” (Merriam, 2009, p. 222). Replication is inappropriate and impossible in a social science study where human behavior is not static (Merriam, 2009). Instead, to establish reliability in this study, I considered “whether the results are consistent with the data collection” (Merriam, 2009, p. 221). To ensure that the findings are reliable, I kept an audit trail that detailed how the data were collected, how categories were arrived at, and the decisions that I made throughout the research process. I journaled on paper and electronically using a reflexive diary (Wall et al., 2004) to document any decisions I made in the research process, including thoughts, feelings, and perceptions. I referred to this diary to understand how I arrived at specific themes or made specific decisions in the data collection.
CHAPTER 4: RESULTS

Through this study, I sought to reposition dis/abled students of color as knowledge generators whose counter-stories can challenge the majoritarian stories that frame dis/abled students of color through a deficit lens. The counter-stories provide a nuanced and complex insight into normative conceptions of smartness, ability, and resistance in the mathematics classroom. As mathematics researchers and educators work to reimagine equity in mathematics education for students, studies centering on the voices and experiences of multiply marginalized students are still emerging. There is a need for studies that highlight the ways dis/abled students of color, the multiply oppressed (Annamma et al., 2016), navigate, subvert, or resist the educational system that positions them as less than.

To present the findings, I first provide third person counter-stories of each of the seven participants. I then provide a cross case analysis of the data that is organized around the research questions that guided the study:

1. How do dis/abled students of color interpret being raced and disabled in the mathematics learning environment?

2. How do dis/abled students of color resist the normalizing process of racism and ableism in the mathematics classroom?

Counter-stories

The counter-stories shared in this section center the voices and experiences of the participants of this study (Annamma et al., 2016) and attend to a social justice agenda by empowering participants to share their stories (Miller et al., 2020; Solorzano & Yosso, 2002). The participants’ counter-stories present a descriptive experience of the ableist and racist
practices that they experienced during their learning experiences and their responses to those oppressive forces.

Presenting the findings through each participant’s counter-stories underlines the unique ways the participants experienced the forces of ableism and racism in their educational journeys and how they resisted those forces. Although much of their stories emphasize the degradation of racist and ableist school practices toward dis/abled students of color, it also highlights the ways in which the participants resisted those practices.

All the participants learned mathematics in inclusive classroom settings, alongside mostly non-dis/abled peers. By many accounts, the participants are all “success stories” in the educational systems. They all successfully graduated high school and were pursuing postsecondary degrees at the time of the interviews. However, they were all critical of their educational experiences learning mathematics.

BB

BB struggled to fit in during her high school years. Having a twin sister, BB joked during our first interview about her life’s experimental nature, comparing her learning experiences as a dis/abled student with that of her nondisabled sister. She attributed her scientific perspective to her mother being a scientist. BB’s diagnosed autism qualified her for an individualized education plan (IEP) that included learning services such as a separate testing environment, extended time, and modifications to some assignments. She self-identified as “Hispanic”; her father recently immigrated from Mexico, and her mother is a second-generation “Hispanic-American”. At the interview, BB was 21 years old and attending a private 4-year university in Southern California. During high school, she developed a strong passion for learning mathematics in high school, taking two mathematics courses at the same time because she could not decide between AP
statistics and precalculus. She enrolled in her undergraduate college as a mathematics major but later switched to history (for reasons later described in this section).

**Embracing a Student Centered Approach to Learning: “Math is Magical.”**

During our first interview, BB recalled while describing her Education Journey Map (see Figure 6) how she discovered the magic of math through the math curriculum at her school. She described how the mathematics curriculum guided her to intuit the math concepts like the law of cosines on her own without having to rely on the teacher during Interview 1, saying:

> We had these books where it would guide you into intuiting math concepts itself instead of having the teacher teach it to you. They no longer do that because apparently, it was marvelously unsuccessful, but for some reason, it really worked for me. That’s why I like math because I got to figure it out myself as I was deriving the law of cosines by myself. I was like, math is magical; this is amazing.

This self-discovery, constructivist approach to learning mathematics allowed BB to learn mathematics without relying on her teachers or peers. She described her discovery of the law of cosines as the “epiphany of her life” and appreciated the “logic” of geometry. She described an appreciation for a mathematical learning experience that emphasized conceptual understanding over rote memorization of procedural skills.
Figure 6

**BB’s Education Journey Map**

- **9th Grade – Geometry**
  - My adjustment period – transitions have always been hard for me, so the major transition to high school was a big deal!
  - Thankfully, this class was super easy for me
  - Positives: I love the logic of geometry, it was something that really made sense for me... so much better than my lit and other humanities classes!
  - Negatives: Common core curriculum meant lots of interaction in groups and working with groups of 3-4 other people. During those class periods, I always ended up focusing on the ‘rules’ of socializing instead of the actual math stuff, so that kind of sucked
  - Iconic line from my Geometry teacher, in response to frequent complaints that one group member was doing all the work by themselves (paraphrased slightly, my memory isn’t perfect): “You all are such martyrs... It’s not like your groupmates leap into your backpack and carry you thrush the finish line. It’s fine”

- **10th Grade – Algebra II/Trig**
  - Because it turns out I actually like math
  - This class was awesome for two reasons.
    - 1. [Redacted], the teacher, was awesome
    - 2. I discovered I actually enjoyed math, and fooled around with the idea of becoming a math major in college
  - Positives: [Redacted] was very forgiving with late work, and her tests were graded kindly (they didn’t make up a lot of our grade, so I had test anxiety, it didn’t screw me over too much). Also, I really liked algebra, so it was a fun exploration of a subject I was actually interested in.
  - Negatives: The group work was the worst in this class!!! Autism problems [Redacted] was pretty disorganized, and that could be very triggering for me sometimes.

- **11th Grade – Precalculus and AP Stats**
  - Because yes, I really do like math: my counselor did everything she could to discourage me from taking two math classes at once, but I had a free period and I just couldn’t decide between the two!
  - Positives: I was really good at precalc and awesome at stats. I also genuinely enjoyed both classes, particularly because I had [Redacted] again for precalc. This was the year I firmly decided I wanted to be a math major.
  - Negatives: Turns out group work doesn’t just go away after lowerclassman years, so that became a significant issue again
  - Of note: 2nd semester of this year was when I had my ‘great breakdown’ of 2017 (I’ll explain later). I mostly kept it together for the remainder of the academic year, but I leaned pretty heavily on my 504 because of it – lots of half-done homework and such

- **12th Grade – AP Calc AB**
  - The fallout of the great breakdown: My calc teacher, [Redacted] was an absolute goddess. I think she’s the only reason I made it through senior year tbh
    - She was very kind about letting me take breaks during class and leave the room to decompress if I ever got anxious. That was the best thing she could have done for me.
    - That being said, her absence policy for quiz makeups was super damaging (It actually ended up getting changed when administration got involved)
  - I adored calculus, and it really helped with my study of physics too.
  - Also, less group work, so that was lovely
  - At this point, I was just ready for high school to be over so I could go to college, so I just did all my work, was present in class as much as possible, and mostly got along with my classmates.

Demanding access to learning services was a consistent part of her strategy for resistance as a dis/abled Hispanic student. While the access needs of nondis/abled individuals are routinely met, the needs of dis/abled individuals are not (Reinholz & Ridgeway, 2021). BB used her agency to advocate for her access needs. For example, BB described in our second interview, when taking the SAT, she “felt not a shred of embarrassment . . . very loudly saying, ‘Hey, I’m not supposed to be in this room. I’m supposed to be in another room. And I’m supposed to have time and a half.’” Her high school required that students with learning services work directly with the teachers to ensure access to those services. BB had to interact face to face with teachers and request access needs such as extended time on assessments, shortened assignments, and a separate testing environment. She recalled:

At my high school, you had to bring it up with the teacher yourself if you had accommodations, which was always frustrating in and of itself, because I have trouble talking to people face to face. So even when I did, teachers would treat it like a personal affront like, “How dare you ask me to give you extra time on this quiz. Because it’s such an inconvenience to me.” And I’m like, “Yeah, it’s an inconvenience to me too.”

BB recognized that her teachers often treated her legally mandated learning services as an additional burden. They had to adjust their teaching practices to ensure she had access to the curriculum. At one point, BB described going to the school administration because a teacher did not allow her to make up a quiz when she was absent, a violation of school policy. Demanding access to what she should already have a human right was a consistent part of BB’s educational journey. As a high school student, she challenged the existing power structure between student and teacher and demanded her teachers provide an equitable and accessible education. She
challenged a system that positioned the teacher as the authority, expert figure, and the student as the passive learner in the classroom.

*Paternalistic Methods of Teaching: “I Had to Pretend to I Was Doing It the Way the Teacher Showed.”*

BB frequently mentioned the role of her teachers in mediating her success in learning mathematics in school. The good teachers were the ones who willingly provided learning services while the less favored teachers focused on paternalistic methods of teaching mathematics. During our first interview, she described one of her good teachers who focused on BB’s understanding of the mathematics rather than on compliance of classroom rules, saying:

I had one teacher who was extra nice about it (accepting late work) . . . I did tell her that I had issues with group work and making it through all the homework on a regular basis. She would give extensions to anyone who asked her, but she would give them hard time. She didn’t give me a hard time. It was no questions asked. No “what’s going on? What other work do you have to do? Why are you asking me for an extension?” (For me) it was just “Okay you’re fine.” She would accept problem sets that were half done if all the problems were right. It was like her acknowledging the fact that I understood what was going clearly because I did the first half, but I didn’t have the stamina to make it through the whole thing. That was super helpful so I could focus on getting the rest of my homework done and getting 8 hours of sleep and all of that. She was just a good teacher.

For BB, a “good teacher” focused more on the learning of mathematics rather than the schooling nature of learning mathematics. The less favored teachers insisted on the schooling nature of mathematics: following the teacher’s preferred method of solving the problem, meeting
deadlines, and complying with the rules and social norms of the class. During Interview 2, she shared:

The difference between my good teachers, and my not-so-great teachers, the good ones always knew different ways to talk about things if you didn’t get it the first time. And the not-so-great ones just basically had that one way. And since that was how they did it, then if you didn’t understand then you’re out of luck.

Later in Interview 2, she described the ways some of her teachers would mandate following the teacher’s preferred ways of doing mathematics:

I had a couple of teachers who would mark your homework and your tests wrong if you did a problem a different way than they showed it, but you still got the right answer. If I went and I looked for a way of doing things that made more sense to me, I had to pretend I was doing it the way the teacher showed me or I wouldn’t get full credit.

During the final group interview, BB posted a comment questioning why mathematics insisted on following one prescribed method of solving a problem. She confronted the banking model (Friere, 1970) of mathematics where a teacher dictated and students regurgitated the teacher’s method of solving a problem. BB challenged the singular and narrow scope of mathematical instruction and assessment that constrained her understanding by only permitting the teacher’s method of doing things, even if that did not make sense to her.

*Ableist Conceptions of Being and Knowing: “But, Your Score Doesn’t Count Because You Get Extra Time.”*

Throughout the interviews, BB described the explicit and implicit ableist practices in her mathematics classroom that made her feel that she did not belong and did not deserve her
success. BB described how some of her mathematics classes deemphasized the role of the teacher in favor of students working cooperatively to solve the mathematics. However, groupwork was a constant source of frustration for BB. She described during our first interview how she had to negotiate the social norms of peer interactions while also learning mathematics. For BB, her identity as a dis/abled student of color learning alongside nondisabled students made her feel like her peers were judging her. She was hyper-aware of how students were judged based on implicit social norms. She would “spend all of the class understanding the social rules . . . instead of spending the time focusing on learning actual math . . . [I was] thinking in my head, ‘Am I talking enough? Too much? Do I need to make eye contact with these people while I talk to them? What do I say here?,’” she shared during Interview 2. Mathematics class became a lesson on learning to appear normal or nondisabled rather than learning mathematics. Later in Interview 2, she shared with the rest of the participants:

I felt like I was stepping into an environment designed to be comfortable for other people at my expense. Like I had to be uncomfortable so that the other people in the class wouldn’t have to be. And that’s frustrating when you’re just there to learn. I just wanted to learn math.

BB described navigating the tensions between following normative social constructs of interacting and doing mathematics while learning in cooperative groups. She said:

My coping during group work was to completely shut down socially and do all the math work myself. I would do all the work that was designed for four people. If the choice is doing the work of 5 people or socializing with 5 people, I would take doing the work. I would end up with math class fatigue. I really enjoyed math, but I was so tired all the
time. I think if the math content were more challenging for me, I wouldn’t have been able to handle it. I just happened to be really good at geometry.

BB chose to focus on practicing mathematics rather than attempt to appear “normal” to her peers. She opted out of this tension and rejected following the implicit social norms dictated by her mostly nondisabled peers. However, her teachers and peers misinterpreted that choice as BB just doing all the work for the team. During Interview 1, she said:

The teacher would make a lot of salty comments though like “I have been getting a lot of complaints that one member of the group is carrying the group in the finish line, and they climb in your backpack you carry them.” Basically, stop being a martyr. I would just have my little chuckle in the back of the classroom.

Not only did BB face challenges learning in a cooperative learning environment with her peers, but she also faced scrutiny from her peers because of her academic success. Peers often perceived her access to learning services as an unfair advantage. During the second group interview, she recalled how her peers would comment on her high quiz grade with negative comments like, ”Oh, but your score doesn’t really count because you get extra time, right?” Peers scrutinized her success because she received learning services legally mandated by her IEP. They had normalized the socially constructed notion that mathematical ability is connected to speed (Borgioli, 2008). BB attributed her peers’ resentment for her success to the hyper-competitive environment where students view each other as taking their spot in admission to specific colleges or universities.

She reacted to this scrutiny by, at times, internalizing the comments and believing, “[I] shouldn’t be proud of [my] grades because [I] cheated to get to it.” She also avoided talking about her grades with her peers. Instead, she let her peers presume failure because of her
dis/ability. She said they commented, “Oh, she must not be doing well if she has accommodations.” Her peers’ reactions reflect ableist views that dis/abled people cannot, or should not, be as successful as nondisabled individuals (Campbell, 2008).

During the second interview, BB poignantly commented on how the school environment positioned her as dis/abled and as the other. She learned that success in school required pushing back against the constraints of the learning environment. The school’s learning environment was not designed for students like her. She said, “I’ve taken tests in the back of classrooms, in the front office where people are walking in and out, under a music practice room where the orchestra was rehearsing . . . they had nowhere else for me to take it,” She was supposed to test in a distraction-free environment, yet the school never established a separate space for accommodations for extra time or a distraction-free testing environment. She had a right to these accommodations but asking for them made her feel like an “inconvenience,” a “burden,” and “the student they [teachers] didn’t like because they were so much trouble.”

Compounding Marginalization of Racism and Ableism: “It Exacerbates the Feeling That I Don’t Belong Here, and With Autism, That Was Already a Thing.”

Her identity as a dis/abled student was a prominent theme throughout the interviews. However, she did not explicitly mention her race in the interviews until I asked her directly about her race or ethnicity’s role in learning mathematics. BB attended an ethnically diverse high school with White, Hispanic, African American, and Asian students. Her identity as a Hispanic student did not make her feel like she did not belong. Nor did she describe any personal experience of particularly violent or explicitly racist interactions or policies in her education journey.
However, BB did point out interpersonal forms of racism that existed for some students at her school. BB noted that as a Hispanic student who spoke fluent English, she “never had any of the same issues that a lot of the other Hispanic students who spoke Spanish as a first language, for example, had.” Those students often had separate learning environments from their English-only peers.

She further described during the first interview how all her math teachers were White, like “blonde hair and super pale skin and going to church every Sunday with our two children in the suburbs White.” Such an image contrasts starkly with the student population and community in which her mathematics teachers taught—a predominantly working-class, Latinx community. BB acknowledged the cultural and racial gap between her mathematics teachers and their students. She did not question or challenge this disparity. Nor did she indicate that it impacted her relationship with her teachers. The racist structural policies perpetuating the disproportionate number of White educators teaching in the United States (Kohli, 2018) were normalized in BB’s experiences learning mathematics.

It was not until BB enrolled in a private university with a predominantly White student body that BB experienced the dual burden of being both dis/abled and non-White. BB described the multiple layers of othering she experienced as a dis/abled student of color learning alongside mostly nondisabled, White students. During Interview 1, she shared:

No one is using racial slurs, but the culture at—-is very uncomfortable for minorities. It’s just the feeling of “Wow, I am the only Hispanic person in the classroom.” That doesn’t feel great. [There’s] sort of that passive aggression about the whole thing. It exacerbates the feeling that I don’t belong here, and with
autism, that was already a thing. Especially in math and science as you get a
distinct feeling that you don’t belong there and it’s really uncomfortable.

She described a learning environment that positioned her multiple identity markers as a
dis/abled student of color placing outside the boundaries of “normal.” After enrolling as a 1st-year mathematics major, BB decided to change majors to history because she found the social
environment of the history major more inclusive of her identity. The history department reflected
a more diverse student body than the mathematics department.

MJ

MJ loved playing soccer in high school and continues to coach high school students while
attending community college. MJ described during her initial interview her complex racial
identity. Part of her family is from Spain, and the rest of her family is native of Mexico and
California. Ethnically, she considered herself Mexican. On forms, she chose either Hispanic,
Latino, or Native American. At the interview, she was 19 years old and graduated from high
school 2 years prior. She enrolled and passed Integrated Math 1, Integrated Math 2, and then
Statistics during high school. She chose not to enroll in mathematics in her final year of high
school. The IEP that she attained in ninth grade included the following conditions: ADHD and
auditory processing disorder. It also required that her school provided the learning services,
including extra time on assignments, assessments in a separate testing environment, additional
instruction if needed, modifications of assignments, sitting closer to the front of the classroom,
and being allowed to take notes on a computer. Additionally, she received cognitive behavior
therapy weekly during school hours.
Narrow Conceptions of Mathematical Ability: “I’m Just Going to Fail Regardless.”

During our first interview, MJ described how the mathematical learning was not designed for her to succeed, despite her effort. She internalized the hegemonic belief that mathematical ability is defined by performance on individual, often written, summative assessments. When she began describing her Education Journey Map (see Figure 7) during our first interview, MJ noted that almost all her memories of learning mathematics in school were “honestly, just really bad.” Learning mathematics became an experience of repeated failure. In this excerpt, MJ described how the experience of taking a mathematics exam:

I was literally sitting there, trying so hard and doing everything. And then, after, I was like, “Okay, I probably at least got a C on it. Maybe I won’t get a D as my final grade.” I ended up seeing my grade a couple of days later, and I completely failed it. I was just so upset because I actually tried so hard. And I still failed. I still got a D in my final grade. That was horrible. I had already had bad experiences before that. But once that happened, I was just like, “Dude, why do I even need to, why do I even try? Even when I do try, it does not change anything. I don’t try, and I fail; I try, and I still fail. There’s really no point in me doing this. I’m just going to fail regardless.

She described a learning environment that determined success and failure by individual performance on an exam and conditioned her to believe that mathematical excellence is narrowly defined by a letter grade on a summative assessment. Moreso, this was not an assessment designed for her to succeed. Learning came to be defined as a thing to be achieved, rather than a process.
Her journey map (see Figure 7) was filled with negative descriptions of mathematical learning: “very confused,” “not many good relationships with math teachers,” “kicked out,” “failed,” “horrible state of mind.” Her outlook on her educational journey only began to improve when there was “no more math.” Despite her negative experiences with learning and doing mathematics in high school, MJ was the only participant to use a mathematical representation—a line graph—to describe her educational journey. She did not see herself as a mathematical doer because of her experiences of repeated failures in her mathematics classes. Yet, she used a mathematical representation to communicate her journey.

*Confronting Societal Expectations: “My Life Shouldn’t be Miserable.”*

MJ’s tenacity to resist societal expectations of how she should behave became her resistance strategy. This strategy was forged during her early years attending a private
predominantly White elementary school where she held on to her identity as a Mexican American from a working-class community. She shared:

“They looked at me as if I was less than and just some Mexican who lives in ________. I was beneath them. My hair is naturally really curly and I remember wearing it down for picture day. They told me, “Why didn’t your mom brush your hair today? Your hair is all over the place right now.” And I was like, “That’s how my hair is.”

She carried this resistance strategy into the mathematics learning environment, where she challenged the normative beliefs about the purpose of learning mathematics. MJ described how individuals would attempt to motivate her to complete her mathematics assignment because doing things you “hate” was a necessary part of life. She shared:

“I’ve been told this so much in my life. It’s like a trigger phrase at this point -”You’re not going to enjoy everything in your life . . . Oh, not everything, you know, is supposed to make you happy . . . Oh, well, sometimes we’re going to ask you things that we don’t want to do.” Okay, yes, but that doesn’t mean that my whole life should revolve around doing stuff that I fucking hate. My life shouldn’t be miserable.

Succeeding in mathematics became an emotionally painful experience to pursue what she enjoyed. MJ challenged societal expectations that seemed to devalue joy and happiness, saying:

Why should I have to go to some stupid job that I don’t? Why should I have to go to school just to get a piece of paper that says I’m smarter than other people? Why should I have to suffer all this time just to survive? My life should be full of things that make me happy, and I shouldn’t have to be suffering all the time.

She critiqued a schooling environment that demanded students obey and conditioned them to believe that a high school diploma certifies smartness and intelligence.
An Intractable Problem to be Discarded: “They Didn’t Try to Change the Way They Taught It.”

MJ never described feeling valued or accommodated in the mathematics classroom. Rather, she felt she was viewed as an “intractable problem” that did not belong in the mathematical classroom (Annamma et al., 2020, p. 116) For most of her educational career, especially in math, her “experiences were kind of bad because the adults at her school treated her as ‘the other.’” She described how her teachers labeled her as a student who was “misbehaving,” not trying, “lazy,” “the other,” notably before she received a diagnosis for a learning disability. In middle school, MJ was not yet diagnosed and recalled how the adults made comments to her like, “Oh, you’re just misbehaving, you just don’t want to try, or you’re just lazy.”

She described how she struggled to learn in a “one size fits all” instructional environment, and her teachers chose to label and set her aside rather than “actually help” or “change the way they taught.” Labeling her as “misbehaving” and “not trying” removed the educator’s responsibility to adjust their teaching practices and instead placed the responsibility on MJ to understand the teacher’s way of knowing. MJ recalled, “I never really experienced people trying to actually help me understand things. They didn’t try to change the way they taught it to me even though they saw that it was not working.”

A Culture of Exclusion: “There Was No Way to Make It More Relatable to Them.”

MJ critiqued the lack of a culturally responsive curriculum in her mathematics classes that contributed to her feeling excluded from the mathematics classroom. For example, she described how her mathematics class attempted to connect mathematics to the real world by connecting to the mathematics to the Oregon Trail. She recalled:
We had to learn the Oregon Trail, and who was doing all that in the Oregon Trail? The people who frickin colonized us! It never sat right with me. When we learned about correlation and causation, instead of doing stupid little examples like, “oh, Jim did this when he went to the store, but this other thing happened at the same time,” how does that affect it? There was no way for kids to do that themselves, make it more relatable, and make it understandable.

She was critical of her mathematics educators’ inappropriate and misguided attempts to make mathematical content relate to her and her peers’ lives. The curriculum maintained the hegemonic Whiteness in school classrooms by, for example, presenting scenarios and problems that presumed the students would connect with stories of White settlers colonizing the lands of indigenous peoples or presenting seemingly colorblind problems about “Jim going to the store.”

**Remediating the Student Rather Than the Learning Environment: “I Just Learn Differently.”**

Through all the interviews, MJ described how she was positioned as a failure, highlighting how the learning environment neglected her identity as a student of color and as a dis/abled student. Her story described how the school system compelled her to change and abandoned or disciplined her when she did not or could not. Not only did the mathematical learning environment devalue her identity as a student of color, but it also neglected her identity as a student with a dis/ability.

MJ found that learning and demonstrating her understanding of mathematics was a challenge because, as she stated, “I just learn differently.” MJ described trying unsuccessfully to fit into and follow the prescribed ways of doing and learning mathematics. Teachers and peers did not understand that she needed to do the material differently, be tested differently, and demonstrate her understanding of the material differently. She said, “My brain, that’s just the
way it operates. And me trying to write that down, especially if the teacher wants it to look a
certain way. It was like my brain trying to work backward.”

She adamantly resisted her peers’ perception of her accommodations of a distraction-free
testing environment or extra time as a “lucky” advantage. She said:

This [math test] is just as hard for me as it is for you, if not harder. This is just trying to
level the playing field because I already have to work 10 times harder than you do. So it’s
not a luxury to me. It’s an adjustment to make things doable.

Teachers also, at times, viewed her accommodations not as a legal right but instead as a
way for individuals not to work as hard or for individuals who are not as competent. She
commented:

They [teachers] equate adjustments and accommodation to excuses or try to make it
equivalent to academic competence or something. But it’s not; I just learned differently,
so I have to do the material differently and be tested on the material differently or in a
different way.

One teacher openly denied her request to test in a separate area, a learning service she
was legally granted as part of her Individual Education Plan. She recalled:

I was like, “Hey, can I go take my quiz in the office?” And then he was like, “Do you
really need to take the quiz over there?” And I was like,” well, that’s what my
accommodations are.” And he’s like, “well, it’s not that long. You can just stay here and
take it with everyone else.” He just kind of made me feel really dumb about it.

The teacher used his authority to question her right to learning services and access needs
openly and positioned her as wrong for challenging his practices. Her treatment as “the other” in
the classroom impacted her status when working in collaborative groups during math class.
Working in groups during her mathematics classes, she felt her peers judged her from the onset. She said:

I always felt very uncomfortable when I had to work with others in math, but in a different way. I felt like I automatically got treated as the dumb one, and they would either patronize me or think I was just there to joke around and not care when in reality, I was really struggling.

She challenges the presumed incompetence that her peers held of her. She did care about her learning; yet, her peers and teachers dismissed her. During the final interview, a participant shared that the mathematics learning environment was not for students like them (i.e., dis/abled students). MJ responded by sharing that learning mathematics is for students who already know mathematics, and everyone else is secondary.

MJ did meet the 3-year high school graduation requirement of mathematics at her school, allowing her to graduate high school and pursue a postsecondary degree. She was finding more joy in learning in college as she had more choice and flexibility.

Ariel

Ariel is a first-generation Mexican American who grew up in Southern California. She overcame several setbacks along her Educational Journey, including attending several different elementary schools as her family moved around “constantly” before settling in an ethnically diverse, working-class community. She attended and eventually graduated from a public charter high school with a student body over 90% Hispanic. At the interview, Ariel was 19 years old and enrolled in a local community college where she was pursuing a degree in Marine Biology. Ariel received an Individualized Education Plan (IEP) during her ninth-grade year for a learning disability. This IEP granted her access to learning services that included “more explanations” and
a separate testing environment. Her mathematical journey describes a journey of resilience and academic success. Ariel repeated Integrated Math 1, a ninth-grade course, three times before enrolling into the next mathematics level. Ariel eventually earned a B in her senior-level mathematics course.

*Privileging Speed, Memorization, and the Teacher’s Ways of Knowing*

During Ariel’s earlier memories learning mathematics, she recalled an learning environment that privileged students who were able to memorize and quickly recall mathematical calculations, which she shared during Interview 1. When she first began describing her mathematics journey in our first interview (see Figure 8), Ariel initially focused on describing the procedural rules of mathematics. She attended to the deficits of her mathematical learning by describing how she “struggled” with fractions and word problems. She describes improving on but never finishing her timed multiplication tables test during middle school. When Ariel entered her high school mathematics class, her conception of mathematical excellence was narrowly defined by her ability to replicate the rote procedures of converting decimals and fractions or memorizing the multiplication tables. This perception of mathematics as focusing on memorizing procedures and performing calculations as quickly as possible rather than developing conceptual understanding is dominant in many US classrooms (National Council of Teachers of Mathematics, 2014). Her experiences (see Figure 8) lacked descriptions of a student-centered mathematical learning environment that emphasized investigations, explorations, or students posing questions.
Ariel described how visuals were a breakthrough in helping her understand mathematics. When the mathematics was verbal or written, she said she “needed things to be repeated multiple times.” Visuals made were more helpful, and she was able to learn more independently rather than relying on her teachers or peers to repeat their verbal or written explanations. She could refer to the visual example instead of a written or verbal explanation that was often unhelpful.

She learned that doing well in mathematics often meant abandoning personal methods of solving a problem and instead of following what “they” say to do. She said:

You just really have to understand what they’re saying and how to do the work. That’s how it’s easy instead of overthinking it and making it hard. I used to read the problem and do it
in the most complicated way possible. They would say, “Why would you do it this way when it’s really just this simple?”

Her methods of doing mathematics were not as valued as the dominant ways of knowing and doing mathematics. The feedback on her solving methods led to an internalized belief that doing well in mathematics meant following the dominant, “simple” methods and abandoning personal approaches to solving a problem.

**Challenging Low Expectations: “She Knew Something Was Wrong.”**

Ariel’s mother refused to wait for the school to consider a possible impairment that might be the source of Ariel’s academic challenges. Instead, Ariel’s mother used her resources to advocate for her child’s needs. The school might have never considered testing Ariel for a learning dis/ability and instead accepted Ariel’s academic performance as a reflection of the low expectations they held of other students of color. Confronting this expectations, Ariel’s mother advocated for her to receive learning services that would support Ariel’s success. Recognizing that Ariel was failing her Mathematics and English classes, Ariel’s mom did not accept this as “normal,” but instead insisted that the school assess Ariel for a learning disability, which she shared during Interview 1. She “knew something was wrong.”

While Ariel described initial frustration with her mother’s involvement in her schooling, she later appreciated the academic support that her mother demanded. These academic supports—the extra explanations, separate testing environment, and support class—gave Ariel access to a more equitable learning environment where she could find academic success. Her mother’s insistence that Ariel receive access demonstrated her mother’s persistence and resilience as she had to overcome power and privilege inequities that came with being a first-generation, Spanish-speaking parent navigating a primarily English-speaking school system. Her
role in Ariel’s educational success disrupts deficit assumptions that Latino parents do not care or are uninterested in their children’s education (Olivos, 2004).

**Disruptive Positioning: “It Felt Good Because I Was Able to Share How I Did It.”**

Throughout her mathematical learning journey, Ariel describes two types of mathematics educators: the “boring strict” teachers who represented a carceral agent (Annamma, 2018) and the humanizing teacher who actively disrupted the traditional role of the teacher as the sole authority in the classroom. Ariel’s narrative highlights teachers’ authority in demanding student compliance in the classroom. During our initial interview, Ariel described how she “hated” the teachers who demanded strict obedience in the classroom by punishing noncompliant students with labels of the “troublemaker.” They were the “boring and strict” teachers who “gave bad grades” to punish noncompliance. Ariel underscores the power that educators hold by “giving” bad grades and using grades as a tool to demand compliance. In response, Ariel would choose to “sometimes not do my homework” as a means of taking ownership of what she did have power over.

Ariel also described positive learning experiences with humanizing mathematics teachers who fostered a mathematical learning environment focused on positive relationships and authentic caring (Valenzuela, 1999). Ariel described how she “loved my 12th-grade teacher” because she shared a similar passion for Disney and “gave her time” to meet with students during her lunch break. She also sat Ariel with her friends and practiced mathematics together as a cooperative team.

Another humanizing mathematics teacher positioned Ariel as an asset in the classroom. During our initial interview, I asked Ariel to describe when she was valued in the classroom. She described a time when her mathematics teacher paired her with another student. As Ariel did
well on the previous quiz, she shared her approaches to solving the quiz problems with her partner:

That’s when I was able to help someone. I showed them what I did or why I did this or how I did it, so they can know what they did wrong. And they can do it again, better next time. It felt good. Because I was able to share, how I did it, versus how they did it. And just explain it more if they needed to.

Her humanizing mathematics educator delegated authority to her students, to Ariel, in being the expert in mathematical understanding. Ariel saw herself as a mathematical doer, and it “felt good” sharing her strategies with her peers. In these more humanizing learning environments, Ariel described having more “confidence” and actively asking for help from her peers and teacher.

*A Dysfunctional Ecology: “They Would Look at You.”*

Ariel described learning mathematics in a “dysfunctional ecology” (Annamma & Morrison, 2018) where she was viewed as a nonvaluable resource in the classroom. Rather than value her resiliency and persistence in retaking a mathematics class for the third time, Ariel described being positioned as a deficient and not belonging in the learning environment. At times, Ariel described feeling judged by her peers and teachers while in the mathematics classroom. In particular, she described being “picked on” by her peers for repeating a ninth-grade class. Ariel reacted to this hostile learning environment by refusing to participate actively with her group:

I didn’t like to talk to people. I would get picked on. I didn’t go well with them. I didn’t like either of them. When I would get called on in class, everyone would stare at me or
say something. Or I thought they would say something. I wouldn’t talk unless I had to. I did the work on my own.

Asking for help from her teachers when she was already positioned as incompetent only exacerbated this label:

I wouldn’t ask the teachers either because it was just embarrassing getting the attention in front of everyone. They would just look at you. I didn’t understand what the teacher would say even when I asked for help.

Ariel’s learning dis/ability impacted her ability to understand verbal or written ideas. As much of the mathematical learning in the classroom was expressed verbally, Ariel described how she “needed things to be repeated multiple times” and was “always nervous asking them [teachers] to repeat things because people would think I didn’t get it.” Ariel highlighted that representing mathematical ideas in singular modalities limited her access and positioned her as unable to do mathematics.

According to Ariel during Interview 1, the capable students were often the “Vietnamese or other similar students” who “earned better grades.” In her classes that were primarily Latinx students, Ariel recognized a racial hierarchy in the classroom reinforced by conceptions of mathematical ability. Ariel’s identity as dis/abled student of color Ariel occupies dually marginalized identities in the mathematics classroom. Without humanizing educators who actively work to disrupt this social construct of who is capable in the mathematics classroom, Ariel was compelled to resist by refusing to contribute to her hyper-labeling as unable or incompetent.
Kirby

Kirby was a proud sixth-generation Chinese American on her mother’s side and a fourth-generation Japanese American on her father’s side. As a child, she loved to celebrate the Lunar New Year by dressing up at school and handing out candy and money to her peers. She spoke proudly during the interviews of her Asian-American lineage that dates to before the Gold Rush. She graduated from a public high school in a suburban, White-dominant area of Oregon, where she was the only Asian American in her classes growing up. She took 4 years of mathematics during high school. Kirby sharing during our initial interview that she was diagnosed auditory processing “disorder” during her younger years as a child. She described how she always struggled to communicate verbally and felt she never had the proper functions or skill sets to have the words come out correctly as she wanted. She pondered whether her struggle communicating was due to growing up in a multilingual house. Some of her family members spoke different dialects of Chinese and Japanese. Her Education Journey Map (see Figure 9) is the only EJM among the participants who used visuals and no verbal descriptions.
Kirby described specific experiences of resisting subjugation because of her perceived status as an English learner, dis/abled student, and student of Japanese and Chinese descent. Her parents played a pivotal role in ensuring her access to mathematical learning. From her earliest years in school, her mother resisted the school’s attempts to place Kirby in a segregated classroom because the school perceived her as non-fluent in English. Her parents understood the educational opportunities that she would miss if she were placed in a classroom separated from her general education peers. Her family also instilled pride in her cultural heritage as multigeneration Chinese and Japanese Americans.
Despite her family’s presence in the United States that dates back over 100 years, Kirby described various ways she was treated as a forever foreigner by her peers. She shared during our initial interview a poignant example of the racist bullying she endured during her childhood years, saying:

I was experiencing bullying, bullying; I was experiencing some bullying issues right there from my friends. A lot of the kids also made fun of me for what I would do as a kid during Lunar New Year; I would always dress up in my Lunar New Year outfits. I would give Lunar New Year candy; I would give quarters in those red envelopes. In the traditional red envelopes that would be considered lucky money, I would give out oranges. I go ham on celebrating the new year! But it was around like fourth and fifth grade when everyone started making fun of me for it. I would always say a couple of phrases in Chinese and a couple of phrases in Japanese equivalent to “oh my gosh,” and a lot of the kids would make fun of how I would say it and would mimic it and make fun of it. I would tell them to stop, but they never stopped.

She was proud of her heritage and family traditions, even if that came with taunting from her peers. Her outward display of her Asian American heritage stigmatized her identity and contributed to her marginalization within the mostly White school community.

Kirby sought out spaces outside of schools to find belonging and acceptance of her identity. Her experiences with racist bullying in elementary and middle school left her feeling “done with people.” However, by the time she started high school, Kirby found belonging in a community outside of high school. She shared:

The only people I dealt with in high school were people in an outside choir, a professional outside choir, and I loved it. And I still thrived with it. I thrived from it. That’s how I got
into [college] because of my opportunities with this choir. It was a really big positive moment; I started winning competitions, I started getting good grades, especially good grades in math.

Her description underscores how students’ lives and experiences outside the classroom impact their learning experiences within the classroom walls.

She recognized that school was not the only place to find belonging and meaningful ways to develop her talents. Finding belonging in her choir group, Kirby was able to feel success in her academic classes, particularly mathematics. In choir, she was an asset. She eventually used her experiences in the choir to earn her a scholarship in college to study music.

*Social Construction of Ability in the Mathematics Classroom: “Tunnel Vision.”*

Kirby described how the learning environment in her mathematics classroom impacted her abilities to learn mathematics. Rather than problematize her own abilities, Kirby highlighted the impact that having specialized support, access to multiple approaches to learning a problem, and visuals allowed her to access the learning.

Kirby’s perspectives on learning mathematics vacillated between experiences of understanding and academic success and experiences of confusion and academic difficulties. In her earliest memories of learning mathematics, during Interview 1, Kirby said her “brain was like ‘no, I don’t want to do the math, I want to have some fun and numbers seem so awful.’” Mathematics was devoid of joy and fun. During her early years, learned mathematics in a general education setting along side her nondis/abled peers and received additional support from educators who specialized in teaching dis/abled students. With the assistance of her special educators, she was “starting to get some of the things that are being told at school.”
Most of Kirby’s mathematics teachers only had “one method to show how it works” that rarely “clicked” or made sense. She describes a mathematical learning environment where the teacher held the authority to banking mathematical learning methods to students. Their teaching was “tunnel vision,” she mentioned during Interview 3, and students were required to regurgitate the mathematical methods in the same fashion as their teachers or “get graded down.” Those mathematics classes focused on arriving at the correct answer using the prescribed methods dictated by the teacher.

Kirby described how she thrived in mathematical learning environments that invited multiple approaches to solving a problem. This multiple approach method was present in the more ‘visual’ mathematics courses—Geometry and Trigonometry. When her classroom mathematics teacher only provided a singular method of solving a problem, Kirby sought out other methods that made more sense. Her private tutor showed her more ways of solving a mathematics problem than the singular methods that her classroom teachers showed.

Kirby realized later in her educational journey her preferred learning style—visualizations. She attributed her preference for visuals in mathematics as the reason she thrived in her geometry and trigonometry classes. She said during our initial interview, “For some reason, that method for visual math helps more and made more sense, but when it comes to math that is not visually learned (I did not understand).”

**Double Jeopardy: “I Was Already the Black Sheep.”**

Descriptions of racist interactions with her peers were rampant throughout Kirby’s educational journey. In her initial interview, she described an incident of two boys telling her that she had no soul because she was Asian:
I remember in middle school, two boys came up to me and said, “Chi Chi Chi, look at me, look at me.” I’m like, why? And they just looked at me, and then, they said in front of my face, “you have no soul because you don’t have a pupil.” I only thought of racism as being prejudiced, someone who was prejudiced to our ethnicity just because of our ethnicity, we can’t do this, or we can’t do that in a way. I didn’t understand that racism could also be categorized as someone saying that you got no soul because you got no pupil.

Kirby learned at a young age to understand racism as more than just prejudice. Despite being a sixth generation American, Kirby’s Asian American identity presented her as a “forever foreigner” who could never achieve full acceptance or recognition as a person in the eyes of her peers or community (Shah, 2019).

Kirby’s story described how her identity as a dis/abled Asian-American student marginalized her inside and outside the classroom. Learning mathematics in the classroom alongside her peers, Kirby had to navigate the reality of her dual marginalization as an Asian American with a learning dis/ability. Group projects in her math class heightened this marginalization; she shared:

I was already the black sheep, “outsider,” in high school. I didn’t want people to know I have this accommodation or disability. I didn’t want people to see me as broken or as an outsider. I didn’t want anyone to see me as worse.

She wanted to avoid being outed as a student with a dis/ability who received learning services. This strategic maneuvering highlights her awareness of the harmful deficits that surround the identity of dis/abled students. Because of her Asian American identity, Kirby was already ostracized in the nearly all-White school community; she was already the “black sheep,”
as she called it. She acknowledged during the interview the dehumanizing impact of being treated as a forever foreigner by her peers. Working in group projects meant risking the revelation that in addition to her outsider identity as being non-White, she also had to reveal her “broken” identity as being non-able-bodied. She revealed the “interlocking oppression” (Annamma et al., 2020, p. 5) that she experienced from the forces of explicit racism and implicit ableism that circulated in her learning environment.

Carina

When she was an infant from China, Carina was adopted by her Asian American mother and Jewish father. She described a complex educational journey that included attending seven different high schools in 5 years before she graduated with a high school diploma. During her education journey, she experienced a range of high school environments: from the private school, she attended since kindergarten, to the public music school she attended in ninth grade, to the various “home hospital” schools she attended while seeking treatment for depression and anxiety, to eventually graduating from a small project-based public charter school in a large city in Western United States. At the final high school, a teacher helped her family secure an Individualized Education Plan (IEP) for learning disabilities. The IEP would also ensure that she would not be pushed out of the school because of her dis/ability, as was the case in her previous schools.

During our initial interview, she described her learning services as including permission to text her therapist while in class, a notetaker “because [her] hands were shaky due to the medication,” and extended time on assessments. In high school, she took the offered math courses of Math 2, Math 3, Math 4, and calculus and two additional mathematics courses at a local community college: college algebra and business calculus. At the time of the interview,
Carina was 23 years old and completing her degree in broadcast and journalism at a private university in a large city in Western United States. She explained that she chose not to major in mathematics because she did not feel it would further her career as much as film, but she said, “I still love math and, I tutor, both paid and unpaid, mostly calculus because I hate stats.” She aspires to create a documentary of her life experiences.

**Consciousness of Dis/abling Math Practices: “Math Class Was for Determining Who Was Stupid and Who Wasn’t.”**

During her middle school years at the private school, Carina observed and experienced how the school system shaped perceptions of mathematical ability and smartness perceptions. Ability tracking, grades, and standardized assessments were integral in determining Carina’s conception of her abilities and others’. Carina participated in extracurricular programs such as Science Olympiad and the Math Team with her friends. She called it “really geeky, STEM stuff.” However, Carina was continuously tracked in the non-honors math classes at her schools. She said during our initial interview:

> There were remedial, normal, and honors (classes). Math class was for determining who was stupid and who wasn’t, to be honest, based on what class you are put in . . . I just always thought I was dumb at math because I was average, and at that school, the average was pretty dumb.

Carina highlights how ability grouping perpetuated her self-concept as a failure when she was placed in the lower status groups. She did not indicate how or why she was placed in the lower track, except to note that once she was placed in the regular track, she would always be placed in the regular track. Tracking into the lower-status mathematics classes locked her into believing she was “dumb,” “stupid,” and “average” because of her placement (see Figure 10).
Eventually, Carina moved to a different school where all students learned in the same classroom regardless of perceived ability. In other words, at her new school, there was no grouping of students based on ability. However, the school still used grades to determine mathematical ability, as do most schools. When she earned 110% in one of her mathematics classes, she attributed it to the “really easy extra credit packets” and the “ridiculously easy stuff” the teacher assigned. She felt she could not trust the accuracy of the grade in determining her mathematical ability. Carina touches on the critical idea that grades are social constructs within school systems, often arbitrarily determined by teachers, yet frequently used as the final determination for student ability and intelligence.
She continued to describe how she could not rely on her grades to accurately measure her understanding of the academic material because she felt they were influenced by teacher bias. Due to her medical treatment, Carina was absent for most of her 10th-grade year. Repeating 10th grade for the second time, Carina felt that her teachers pitied her when determining her final grade. She said:

I felt it was more of a pity thing than anything. I wasn’t going to class a lot. I’m not even convinced I did a quarter of the work in my class that the rest of the students did, and I got an A. I literally got an A for a class I didn’t really take.

She finally felt convinced she was “decent” at math when she earned a perfect score on the California High School Exit Exam (CAHSEE), a standardized test used by the state of California to determine a student’s eligibility to graduate high school. She shared during our initial interview:

I wouldn’t say I thought I was smart, but I thought I was decent when I got a perfect score on the CAHSEE for my math section. I couldn’t really trust the grades that my math teacher was giving me because if you didn’t have an A in that class, then you had to be the type of stupid where you didn’t know how to show up. It was very hard not to have an A in that class. And I think maybe one person didn’t have an A in that class that year.

The CAHSEE is a standardized test, so that was more accurate, maybe not even accurate, because I know standardized tests are coming into question on whether they’re an accurate measurement, but it was good enough for me.

While Carina considers the problematic nature of standardized tests as an accurate measurement of determining an individual’s ability or intelligence, she accepted it as evidence of her ability to do mathematics. Carina’s use of the ableist terms “stupid” and “dumb” highlights
how she internalized the normalized ways that the model of schools of the United States operate as a sorting mechanism for determining who is smart and who is not—who belongs and who does not—based on institutional, yet problematic, tools of tracking, grades, and standardized assessments. Furthermore, the ableist terms reflect the ways that school mathematics operates to privilege those deemed “able” and marginalized those who are “not able” or “disabled” (Borgioli, 2008).

*Tensions Between Self and Context: “That’s All on Me. I Can’t Blame Anyone Else”*

Carina described an educational journey where her IEP granted her power and leverage to resist a school system that otherwise attempted to push her out. Before she had an IEP to grant her educational rights to remain in school, her first high school threatened expulsion because of her chronic absenteeism. She missed school because she was seeking treatment for her depression and anxiety. She said during our initial interview, “By the end of my time there, they said, ‘Look, we’re not going to kick you out. But if you don’t leave voluntarily, we will expel you.’ So it was time to go.” Because of her excessive absences, she was forced out of the music program at her high school and offered a placement at the “sister school across the street, which everyone knows is the school for drugees who are always truant and the pregnant students.” She chose to leave voluntarily. She did not want to be known as the “trouble-maker” and was concerned about the impact her decision would have on her college enrollment. Carina described an acute awareness of the perception of students based on their placements and the impact that such labels would have on their future trajectories.

She continued to describe during our initial interview the school she eventually graduated from, where she found a more caring and “inclusive” school with “loving teachers” and a dean she felt comfortable going to when she felt “agitated.” Her advisor made sure to “lockdown an
IEP” that ensured she had educational rights to remain at the school. However, the IEP was “a little bittersweet.” While the IEP gave her more power, it also distinguished her from her peers. Carina was aware that using learning services may contribute to her peers’ beliefs that she was different from the rest of them.

Carina grappled with whether to use the learning services provided by her IEP because she wanted to “be like everyone else.” Carina commented about wanting to be like everyone else when she shared advice with others during our final group interview. She described regret at not using her extra time accommodation during a math quiz that she eventually failed because she wanted to remain in the class. She blamed herself for making that choice, saying:

There was a reason it was provided. And if I’m not using it, then the bad grades that result from it. Like that’s all on me, like, I can’t blame anyone else because they offered me that and it’s my like, it was my decision based on my ego not to use it.

Carina blamed her “ego” rather than a school environment that stigmatized difference and the use of learning services. She displays a meritocratic ideology that faults individuals rather than problematizes the environment.

Carina’s educational journey is marked by resilience in the face of obstacles, particularly those posed by adults unwilling to accommodate her access needs. During the second group interview, she described how she advocated for her educational rights while taking a college mathematics class in high school. She recalled:

The teacher wasn’t very accommodating . . . With the note-taking and the extra time, she was very against it because I didn’t have an IEP through the college, which was the college that I was taking it. I had the inclusion people talk to her, and eventually, she got with it. I get like not trusting my word on it. But I did send her documentation from the inclusion
specialist. That’s what they call them now, I guess, specialist. But that writing wasn’t good enough. It took multiple phone calls.

She described her persistence in ensuring her access needs were met, often needing to include other school adults to advocate on her behalf. Her experience highlights the authority that educators hold in determining whether to provide access and accommodations for the different learning needs of their students. Lacking the same institutional power and authority as the adults on campus, Carina as a student often had to leverage the power of adult advocates on campus to ensure her access needs.

She was grateful for eventually finding a school campus where the climate was “more open” and “inclusive,” she said during Interview 1. The adults of the school displayed authentic caring (Valenzuela, 2005) where teachers and the dean cared for her entire well-being:

I had a lot of loving teachers and the dean. . . I felt comfortable going to her if I was feeling agitated. That isn’t something I feel I could do with any of the teachers at my other school. . . when I came back to school from a 3-month program, they’re (teachers) are all like ‘Oh Carina, you’re here! We missed you.’ No one said that when I missed three weeks at my old school. I feel like the people just overall cared more about everyone.

Carina described a learning community that valued her presence in the classrooms, her emotional well-being, and access to learning. Her previous school superficially cared about her, emphasizing her attendance, placement in tracked courses, and whether she behaved in class.

**Rigid Conceptions of Learning: “We Had to Show Work”**

Carina described how her mathematics teachers cared more about compliance and following teacher-centered practices. During the second interview, she described a constraining
learning environment that emphasized a singular method of understanding a problem. She would “ask for a different explanation, and the people would roll their eyes like I was wasting their time, and then they just explained it the exact same way. If I’m asking you to explain it, it means whatever you said it, the first time wasn’t working.” She was constrained by having to understand how her teacher understands mathematics. The mathematical learning was teacher-centered and relied on the teacher conveying their ideas, rather than those of the students.

The mathematical learning environment that Carina described was also teacher-centered given the fact that the teachers required that the students show their work in a prescribed method:

And we had to show work. I already am slow enough on my tests. I don’t need to take the extra time to (show how I) arrive at an answer that I could have arrived in my head the second I looked at the problem

She was forced to write out her process to prove to the teacher her mathematical understanding. Showing work did not benefit Carina as a mathematical learner or doer; it did not help her process the information. Instead, showing her work benefitted the teacher’s understanding of her thinking.

**Interconnections of Contradictory Dominant Ideologies: “Am I Actually Smart?”**

Carina’s identity as a Chinese American and as a student with an IEP complicated her conceptions of her conceptions of her mathematically competence. The contradictory ideologies of the “smart Asian student” (Shah, 2019; Wu & Battey, 2021) and “difference as impairment” (Baglieri & Knopf, 2004) were dominant narratives in Carina’s descriptions of her mathematical experiences. These narratives were both expressed by her peers and internalized by Carina.
The false myth that Asians are good at math (Shan, 2019) was a frequent joke among Carina’s mostly all-White peers. She described during our initial interview how she was scrutinized by her peers about how smart she should be because of her Asian identity:

But at the level of students, they always joked about how smart I should be, whether I was back at my private school and I didn’t quite live up to it. All the Asian kids were in honors [math]. I was the only one in regular [math]. Or when I was at [public school], and I lived up to it. It’s been said, and I, too, have joked about it. I don’t mind joking about it. But the pressure was there. The intent behind it didn’t seem comedic. It felt like an insult—especially my senior year when we did calculus. I did business calculus the year before that, so that whole year was like a breeze. And people were like, “Of course you’re Asian. Of course, you finished the whole week’s homework in one class period.” And then, at the same time, on the opposite end is like, “Dude, you’re Asian. You’re supposed to be good at math like, when like, you shouldn’t be getting a B+, like you got an Asian F.” Which it was, well I felt it was.

The harm of living with undue pressure to live up to the expectations to be good at math is well documented (Shah, 2019). The “Asians are good at math” myth constrained her identity where she was only permitted to occupy the singular identity of the smart Asian student. So, what happens if she does not meet that expectation? The label of the smart Asian student is dehumanizing, as mathematicians in popular culture are perceived as robotic, antisocial, boring (Shah, 2019). Carina was one of the few Asian American students at her school and one of the few students of color. She said:

There were like five Asian students. They were all in honors classes except me. There were a few Latino students and four Black students sprinkled in. But it was a very White
school. I feel like they put just enough people of color to call themselves diverse, but not enough to actually feel diverse.

While her peers scrutinized her success due to her race, Carina wrestled internally with whether her accommodations provided by the school based on her diagnosed learning disability provided her with an unfair advantage. She said:

I did my best on the test that went to determine the IEP. But sometimes I wonder, “Am I actually smart, or do I just have good grades because I had that extra time?” For a while, that really haunted me: “Am I really doing this, or does this extra time give me an advantage?” That is what is distinguishing me from some of my other peers who aren’t doing as well.

She displayed an internalized belief in a meritocratic ideology that individuals need to succeed on their own through hard work alone. She was hyper-aware of the access to success that her learning services, in this case, extra time, afforded her since her other peers did not appear to have access to the similar accommodations. Yet, she neglected to consider that how meritocratic ideology is deeply flawed; there is no equal playing field in a school system and society with inequitable structures and opportunities. The meritocracy ideology ignores “hidden unearned advantages” (Cobb & Joseph, 2014) that some students might carry. While she learned mathematics in an inclusive setting, the classroom environment problematized perceived differences. Instead, a “truly inclusive classroom strives to bring difference back to the norm” (Baglieri & Knopf, 2004, p. 527).

Carina’s counter story highlights the importance of inclusive classrooms acknowledge that human variation is the norm and all students should be allowed access and provided with
opportunities to learn and perform in ways that address their individual needs and goals, not just students with labelled dis/abilities.

**Dewey**

Dewey described themselves as a “pretty good student” during our initial interview. They enjoyed school and mostly earned high grades; doing well in school gave them a sense of pride. Their mom was a scientist, so they felt they grew up in an education-oriented household. Dewey graduated in 2019 from a high school in Northwest United States. It was in high school that they received the diagnosis of ADD. During high school, Dewey was tracked into the advanced mathematics classes since middle school. By high school, they took Algebra 2, precalculus, Calculus 1, and Calculus 2. They self-identified as mixed-race—half White and half Brazilian. At the time of the interview, Dewey was 20 years old and enrolled as a Junior at a 4-year public university in Northwest United States, where they majored in International Studies and Education. They described an interest in studying international comparative education and pedagogies. Throughout their interviews in this study, Dewey displayed a strong critique of the U.S. educational system that ignored individual differences and stifled innate curiosities.

**Confronting the Boundaries of Learning: “Grade School Was so Cookie-Cutter”**

Throughout their interviews, Dewey described mathematical experiences where they confronted the boundaries of mathematical learning. Most of their mathematical school work was teacher directed; however, it was the internal assessment project that captured Dewey’s curiosity and joy in learning. Their educational journey map described their favorite math memory: the internal assessment they had to do to qualify for the international baccalaureate program at their school (see Figure 11).
It was a self-directed research project where they had to go to the teacher outside of class to figure out how to do certain calculations or get advice. Their report was on how the universe is expanding, and the Andromeda and Milky Way galaxies will collide, as seen by using the Doppler Effect. During Interview 1, they said:

I really enjoyed that a lot because I could choose whatever subject and I could kind of follow my own rubric and basically do whatever I wanted and do something that interested me. And it was completely different than anything we
were doing in class. I had to go to the teacher outside of class to figure out how to do certain calculations or whatever. I got a good score on that. I enjoyed that.

They described how they enjoyed the self-directed learning process where they could choose their own topic, grading criteria, and seek feedback from their teachers. The teacher took on the role of advisor, rather than authority figure dictating the requirements of the mathematical learning.

Dewey also confronted the boundaries established by their school’s tracking practices. Despite their passion for learning and doing mathematics, they were not placed in the advanced mathematics track at their school or initially tested to qualify for the advanced placement. They had to go out of their way to request to be tested into an advanced mathematics class where “it wasn’t everything I already knew,” she shared during Interview 1. Once placed in the advanced mathematics track, Dewey realized that it was “easy to remain ahead.” Students were maintained on the track they were placed. The school established and maintained a firm boundary between the higher and lower track students, solidified by assessment practices. Dewey highlighted the obstacles to mobility within a tracked school system that sorts students based on perceived abilities. Students had to test into the higher track; and could only test after advocating to the teacher or administration to test into the higher track.

Dewey often felt constrained by the “requirements” of the school system. Although they highly valued education and learning, Dewey strongly critiqued the schooling aspects of the educational system: rubrics, criteria, grades, and following the teacher’s prescribed methods. They felt that the worry of meeting a rubric with “sometimes arbitrary and unnecessary” expectations hindered their creativity. During the final group interview, Dewey posted a question to the group about conforming to school’s expectations, saying, “Why is working through
problems in a different way than instructors taught not good practice? I genuinely don’t understand why grade school was so cookie-cutter.” They underscore a school system that ascribes to a banking method (Freire, 1979) approach to teaching where students follow and regurgitate the teacher’s ideas. The learning environment for Dewey was “cookie-cutter” emphasizing molding students into uniform bodies by using a one size fits all method of instruction and curriculum.

They shared their critiques of the educational school system during the final group interview, saying:

The education system doesn’t work for me because I feel like we’re always being pushed to learn things that aren’t necessarily relevant or taught in an interesting way. And, I really wish I could have gone into some sort of school that did self-directed learning. Kids are naturally curious, but when you force them to do things they don’t want to for a long time, they lose that curiosity.

*Whiteness and Ability as Property: “If It Wasn’t for Her, Maybe I Wouldn’t be at the Math Level I Was in.”*

Dewey never felt they had a personal connection with their teachers who would advocate for their access needs. Instead, Dewey would speak directly with the school administration to ensure that they had access to their educational rights. Often, it was their mother that had to go directly to administration and staff to ensure that Dewey could test into a higher level of mathematics classes. They said:

I think it’s weird they didn’t just test everyone to see if a higher level was doable for them - they were hand-selected and I don’t know what the basis was. Even
though she’s Brazilian, she does look White. If it wasn’t for her, I’m pretty sure I wouldn’t be in the math level I was in.

They described a school system that required self-advocacy and a parental advocate to resist being positioned into lower-tracked courses. Furthermore, they highlight the privilege of Whiteness or passing as White when negotiating for greater access in a predominantly White school system. This privilege of passing as White is expanded upon later in Dewey’s counter story.

*Notions of Normalcy: “Everything in This World is Tuned to Whatever Normal Means.”*

Dewey’s counter story reveals the ways that they attended to the racial and ableist script that positioned Whiteness and able-bodiedness as the normative center. Dewey was unaware of any other students in their class that had a dis/ability. For Dewey, getting help was not “normalized,” they said during Interview 1. Instead, they thought getting help was considered cheating. Even though Dewey earned good grades in school, they were always the last person to finish a test. It took “absolutely forever” to do assignments, they shared during Interview 1. All their peers seemed to be completing their assignments faster, and Dewey felt they were spending all their time outside of school completing their schoolwork. Their teachers thought Dewey was “fine” because of their good grades, without considering that it would take them “forever to do things.” Dewey described feeling depressed from the overwhelming amount of time it took to complete their schoolwork.

Dewey described a sense of relief when they received their diagnoses of ADD later in high school. They said, “By knowing what was going on, I could deal with it better. School was such a struggle, and I didn’t know why. I just thought it was like that for everyone, but no one spoke of it.” Spending countless hours completing schoolwork to the point of feeling depressed
was considered normal. Dewey described an unquestioned, unchallenged belief held by students that learning should be “such a struggle.” They described a learning environment where everyone was perceived as nondisabled, no one asked for help even if they needed it, and students are “fine” if they earned high scores. This tacit belief that circulated the school environment upheld notions of ableism: failing students are dis/abled students, students who receive help or accommodations are cheaters, and one’s dis/ability or difference from the norm should remain hidden or obscured from others.

Not only was Dewey unaware of any other dis/abled students in their class, but Dewey was also the only Latinx student in their classes. They recalled during our initial interview that their peers were “only people of European or Asian descent in that class . . . there weren’t Black or Brown people.” Dewey identified as part of the “Latin community” but could pass as a White student. They shared:

There is this U.S. stereotype that minorities and Mexicans don’t try hard, as hard it is for me to say this, that they don’t do well in school, don’t go to college, are in the lower class. I don’t agree with that. But because I was in that same Latin community, I also had to face those stereotypes. It was like internal racism. No one knew I was that race, but I knew I was.

Dewey displayed an awareness of the dominant deficit narratives that portray Latinx students as lazy, not caring about school, academically unsuccessful, and not aspiring to attend college (Valenzuela, 1999). Dewey disrupted that deficit narrative. They worked tirelessly, earned good grades, and eventually attended college. However, much like they hid their learning dis/ability and struggles in high school, Dewey also hid their identity as a “Latin” student. They made strategic attempts to “partake in the benefits of being perceived within the normative
cultural standards of able-bodied and White” (Annamma et al., 2016, p. 24). Being perceived as White allowed Dewey to partake in the benefits of Whiteness, or particularly of not being seen as Latin.

Dewey later shared during our final group interview that they felt math class was designed for “middle-upper class White people.” If their peers struggled in class, their families would hire private math tutors. They said:

For the people who don’t have the privilege of growing up in a White, financially and emotionally stable household but are expected to or want to accomplish the same things, these people often have to find an alternate way to deal with their issues of not doing well in school or being too anxious to ask for help or not having the transportation to go to their school band concert.

Dewey called out the unearned privileges that often remain unchallenged because they uphold White supremacy: the White students who are presumed competent and the wealthy students who can afford private tutors and services. She, later in the interviews, directly confronts the master narrative of “normal.” They stated:

I used to tell myself I was just being lazy. In the U.S., we are taught there’s this normal. And I don’t think normal exists because what is normal? Everything in this world is tuned to whatever normal means and offers itself only to people with normal attributes.

But so many people are not considered normal.

By pursuing a degree in education, Dewey hoped to transform the school system in ways that honor and highlight students’ curiosities. They aspired to a school system that recognized and valued people “not considered normal.”
James

James attended a well-funded, large, comprehensive, public high school in Southern California that he described during his initial interview as an “understanding and nonrace clash area.” He was a popular, well-liked student with Asian, Black, and White friends and played on the high school football team. His Japanese grandparents on his mother’s side grew up in a U.S. Japanese internment camp. His family reinforced to James the values of cultural pride, hard work, and to strive for success. These core values motivated James to pursue a rigorous course in high school. He took 4 years of advanced mathematics courses: honors geometry, College Prep Algebra 2, math analysis/precalculus, and then AP statistics. In high school, he was also diagnosed with ADHD, dysgraphia, and dyslexia. Due to these learning dis/abilities, James acquired learning services to access the general curriculum. During our initial interview, he described the learning services as extended time on assignments and assessments, forewarning or extended notice of upcoming assessments, and “typical stuff” like sitting close to the front of the class. At the interview, he was completing his 1st-year majoring in Business at a private Southern California university.

Disrupting Presumptions of Deficiency: “I’m a Big Concept Person.”

During our initial interview, James remarked how his view on mathematical learning might not be what I sought in this study. Given that he was participating in a study that sought dis/abled students of color, James presumed participants should share their struggles in learning mathematics. His presumption acknowledged awareness of normative beliefs that dis/abled students and students of color struggle academically. But for James, mathematics as a concept was always a subject that “made sense.” He earned his highest grades in mathematics. Unlike the
other subject areas that required memorization, he experienced mathematical learning that
focused on conceptual understanding. During Interview 1, he said:

Math I could actually learn and talk through it. It’s not memorization of number
sequences but of concepts. I’m a big concept person. I like to understand why. Human
nature is to ask why and I’m big on like why is it happening? What’s the purpose of this?
Why am I finding the square root - because the square root takes out the exponent so you
can find the linear and not the exponential function.

He emphasized that having a learning environment that allowed him to “talk through it”
and understand “why” contributed to his enjoyment of learning mathematics. James was
“fortunate to have great teachers in that regard” that provided opportunities to understand why.
They focused on mathematical concepts and understanding over memorization of facts and
regurgitation of procedures. His mathematical learning experience contrasts with the dominant
perception in the United States, where mathematics learning focuses on memorizing procedures
and performing calculations as quickly as possible (National Council of Teachers of
Mathematics, 2014). I wondered how James’s experience and trajectory with learning
mathematics would be impacted if he experienced mathematical learning focused on
regurgitation of memorized procedures.

It was not until he took his first college business math course that he realized how high
school math was designed to complete the standards uniformly. For James:

High school math class isn’t really applicable to college classes or the real world. His
classes and the real world welcomed different ways of solving a mathematics problem.
Whereas high school math classes focused on covering the material in a specific
[teacher’s] way, and for that reason, was not accommodating to different people trying different avenues or approaches.

He challenged a K–12 mathematics curriculum devoid of connections to the real world or focuses on singular, prescribed modes of solving problems.

**Problematizing the Environment Rather Than the Student: “I Was Given the Proper Tools to Succeed.”**

James described himself as a hard-working student, but he was earning low grades in all his classes by the time he got to high school. His parents refused to accept the school’s reason that James was not putting in enough effort as an academic student. During the group interview, James shared that before he was diagnosed with a learning dis/ability, James felt like he was treated as “the problem child” by the adults. It was an easy explanation for his lack of performance for adults to say, “Hey, this student is just acting out. This student doesn’t care.” Rather than problematize the learning environment, school personnel adopted a deficit framing of James and attributed his low grades to “not trying hard enough.”

Despite a teacher’s recommendation for James to be tested for a learning disability, his school denied the testing request or request for learning accommodations. In response, his parents persisted and paid “out of pocket” for him to get tested for a learning disability from a private doctor (see Figure 12). His experience highlights how students with specific privileges and resources can circumvent institutional barriers. Eventually, he secured access to learning services because his parents paid for a private doctor to diagnose his learning dis/ability.
When he received the diagnosis, the school required that his teachers shift their teaching practices to ensure that he had access to the curriculum. James described multiple instances of meeting with teachers to ensure that he received prior notice on upcoming tests and quizzes, separate testing environments, and other accommodations. James began to succeed when he was “given proper tools and accommodations” (see Figure 12). He underscored how learning environment – tools, discourse, and interactions - facilitated his failure and success (Collins, 2013).
Problematizing the Authority of Teachers: “At the Mercy of the Adults”

During the second group interview, James called out the authority and power school adults held in his educational journey. He felt he was often at the “mercy of the adults in his life” who had the power to reinforce or disrupt oppressive learning conditions. A teacher reached out “on her own time and her own care to help” when she suggested James get tested for a learning disability. However, adults at the school also decided that he should not be tested for a learning disability, instead attributing his lack of performance to a lack of individual effort.

Teachers also held authority in mediating his dis/ability in the classroom. James took care to keep his dis/ability discreet since he did not want to be perceived as “different” from his peers. Teachers were not always conscious of this need for discretion. During one instance, a teacher brought up his confidential accommodations in front of the class. He shared, “She asked if I was coming in at lunch to finish my test. And then people kept asking me why I was going at lunch. I was in a weird spot.” James knew he was “legally granted extra time on the test, to have 2 weeks advanced notice of any assessment that would take place, and to have a quiet place to take the test . . . whether or not the administration cares about him, they were by the book regarding his IEP.” Yet, he felt that teachers questioned the need for his accommodations since he was in an AP class or earned higher grades than other students. He agreed with the other participants in the group interview that “just because we are working harder to get these good grades or success does not mean that we are not entitled or should not get extra help.”

Teachers only offered support to James after they found out he had a diagnosed learning disability. Before his school recognized his diagnosis for dyslexia, he felt that he was treated as the “problem child where it was easy for the school to explain his lack of performance as ‘he doesn’t care’ or ‘he is just acting out’ rather than go in-depth, to put in that extra time and see
past the low marks and be like ‘hey, what’s really going on in the students’ lives?’” During the final interview, he advised math teachers to “take the time to get to know the situation” students are in before jumping to conclusions such as “performance directly correlates to how much effort you put in.” In other words, teachers need to avoid concluding that if a student is underperforming, the student is not putting in enough effort. Rather than problematizing the student, teachers and adults at the school need to take the time to know the student and problematize the learning environment that often poses obstacles to student success.

**Being Seen: “I Identify as Me and the Experiences That I’ve Had.”**

Throughout the interviews, James insisted on being seen as an individual with experiences, rather than as a part of a monolithic group of dis/abled students or students of color. He addressed the deficiency lens (Collins, 2013) that often accompanies dis/abled students who are profiled based on their perceived ability. Learning that he had dyslexia provided mixed emotions for James. James mentioned feeling embarrassed or uncomfortable about his learning disability 11 times throughout his first interview. He shared:

I was just so scared and worried when I was getting tested. What if there’s nothing wrong? And what if I’m just stupid, or I’m just not applying myself, and they’re right about how I’m not trying hard enough. It was not a relief or an excuse for my lack of achievement, but it helped me understand the reasons for why stuff is different. I always thought I was a smart kid. I was very embarrassed to talk about [my disability], still to this day. I had feelings that something is wrong with me. It was 11 years of normal. I never thought I think differently. And then I realized, that’s just me, you know?

Learning alongside his nondisabled peers in mathematics class, James tried not to disclose his learning disability or allow it to be apparent to others:
I was embarrassed for a while. I never wanted to read out loud. I never wanted to be like that. If we had a group project, I never wanted to be the group scribe. I probably am spelling everything wrong, and I don’t want to read stuff out loud. It took me a while to get to being willing to participate in class and not really care. I’m a talker, but after [the diagnosis], I did not feel comfortable doing that.

As the researcher on the study, I was one of the first individuals outside of his close circle of family and friends with whom he disclosed his learning disability and learning experiences. He otherwise kept his learning disability to himself, speaking with the teacher about his accommodations away from his peers after class. The only instances he had to interact with other disabled peers were when he would take his test with other individuals who had testing accommodations to be tested in a separate environment. However, even then, he never really communicated with them, saying, “I was just there to do my job and get out of there. I made a really big effort not to let it define me. I was still embarrassed and am still kind of embarrassed.”

He felt he often had to “tiptoe around different things” to conceal his identity as a dis/abled student. He had to navigate how his accommodation for an extended time would work when he was in a group project with students who did not get extended time; or, how he would explain to his peers why he took his AP Statistics test at a different school that could provide a separate testing environment. He recalled:

I went to a totally different school to take it. It was not even on the same campus because they needed a special room to proctor me. I just remember thinking, “I don’t want to be known as that kid.” I don’t even know what “that kid” means. But I just didn’t want to be different. And I didn’t want to have others think, “What, what’s going on with him?”
He was developing “the right mindset” about his learning disability as he wrestled with feeling like he was different from his peers or that he was no longer “a smart kid” because of his dis/ability. He challenged the belief that his dis/ability is something to be fixed or cured:

My grandparents come from the Asian culture [and have a] kind of pride and all that, and also from a place of care, they sent me so many books and audiotapes of pretty much how to fix me. And for lack of better words, to cure it. I don’t think they really understood that that’s not how it works. And I just kind of felt, at the time, overwhelmed: “Oh, my God, I’m just gonna be seen as different.” I was just kind of bugged because I told my parents it was my thing. It’s not your place to talk about it. I was kind of just at the time really embarrassed. It’s ironic. He [grandfather] sent me a book on dyslexia. Do you want me to read this? [Sarcastic tone].

He does not actively talk about his race with others and prefers to keep his learning dis/ability between himself and his professor. He wanted others to view him as he saw himself; he said, “I’m James. I identify as me and identify with the experiences that I’ve been through and not what I was born as.” He underscores an awareness of how deficit framings of dis/abled students or Asian American students can overshadow his complex identity. Furthermore, he demonstrated the multidimensional identities and unique experiences that individuals hold. Dis/abled students and students of color should not be treated as a monolithic group.

A Cross-Case Analysis

The previous sections of the findings document through individual counter-stories the unique experiences of each of the participants’ educational journeys learning mathematics. This next section presents a cross case analysis of the participants’ experiences by highlighting common themes that were present in their descriptions. The themes presented address the
research questions of this study: (R1) How do dis/abled students of color interpret being raced and dis/abled in the mathematics classroom? (R2) How do disabled students of color resist the normalizing process of racism and ableism in the mathematics classroom? For the first research question, the themes of hyper labelling, implicit and explicit bias, and rigid conceptions of mathematics emerged as participants’ interpretation of being raced and dis/abled in the mathematics classroom. For the second research question, all of the participants described various resistance strategies – self defeating, conformist, and transformative – they used to maintain their integrity in the mathematics classroom.

**Research Question 1: How Do Dis/abled Students of Color Interpret Being Raced and Dis/abled in the Mathematics Learning Environment?**

The participants’ counter-stories described how the mathematics classroom often operated as a “dysfunctional ecology” that positioned them as nonvaluable resources (Annamma & Morrison, 2018, p. 114). The participants described how (a) hyper-labeling as “the other,” (b) implicit and explicit biases, and (c) rigid conceptions of mathematics positioned them as “outflows” (p. 114) of the classroom ecology that compelled them to follow the classroom’s prescribed normative behaviors and identities.

**Hyper-Labelling: “The Other”**

None of the participants described school practices or environments that explicitly or implicitly valued their identities as dis/abled students and as students of color learning alongside mostly nondisabled and primarily White peers. Instead, the participants described learning environments that problematized differences among students through various practices that circulated in their learning environments and hyper-labelled them as “the other.” DisCrit scholar, Annamma (2018), described hyper-labeling as “the formal and informal naming of a student’s
undesired identity (e.g., race, gender, dis/ability) and the addition of other unwanted identities” (p. 14). The participants described how adults and peers viewed their identities as dis/abled students of color as undesired. Participants described the following unwanted identities in their interviews: “an inconvenience” (BB), “a social outcast” (BB), “a disciplinary problem” (MJ), “a cheater” (BB), “a burden” (BB), “dis/abled” (BB), “pretty dumb” (Carina), “a troublemaker” (Carina), “the black sheep” (Kirby), “the problem child” (James), “acting out” (James), “doesn’t care” (James), “broken” (Kirby), “outsider” (Kirby), “lazy” (MJ), “misbehaving” (MJ), and “the other” (MJ)

The participants all recognized the negative labels that their peers and teachers associated with dis/abled individuals or people of color. For some of the participants, receiving accommodations such as extended time on tests or modifications to their assignments labeled them as cheaters by their peers, particularly if they were perceived as academically successful. For example, during Interview 3, BB rarely disclosed her academic success to her peers and instead “let people assume that because I was dis/abled, I was getting bad grades.” She chose to accept the deficit framing of the incompetent dis/abled student (Lambert, 2018) rather than face the scrutiny of her peers as a cheater. Her comment highlighted the contradictions of the learning services provided for dis/abled students: the school provided learning services to ensure that the student is academically successful; however, the school then questions the need for learning services once the student becomes academically successful. Learning accommodations such as extended time on a test or a separate testing environment should be a basic access need provided to all students who need them to learn; however, constrained conceptions of access to learning where only certain types of accommodations are permitted to all positions dis/abled students as the “other” when they demand accommodations particular to their learning needs.
In regard to their racialized identities, for the three participants who attended predominantly White schools, their identities as students of color were associated with adverse or stigmatized identities. In the case of Carina—an adopted Chinese American—her peers often joked about her needing to fit the label of the smart Asian student. She shared, during Interview 1:

At the level of the students, they always joked about how smart I should be, whether I was at my private school and didn’t quite live up to it. All the Asian kids were in honors. I was the only one in regular. Or when I was at (public school) and I lived up to it... The intent behind it didn’t seem comedic. It felt like an insult.

Dewey, who identified as White and Brazilian, described the negative labels Latinx students carry as part of the dominant narratives prevalent in U.S. society that permeated their learning experiences during Interview 1, saying:

In the US, there is this stereotype that minorities and Mexicans don’t try hard, don’t do well in school, don’t go to college, are in the lower class. I don’t agree with that, but because I was in that same Latino community, I also have to face those stereotypes.

Studies have shown that teachers hold negative perceptions of the students of color as compared to their White students when it comes to academic ability and achievement (Irizarry, 2015a; Irizarry & Cohen, 2019; Oates, 2003).

The dual identities of being a dis/abled student and a student of color compounded the marginalization felt by some participants. Kirby highlighted the threat of hyper-labeling she experienced when learning mathematics in groups. Group projects became “terrifying”
experiences that might expose her identity as a dis/abled student to her peers. During Interview 2, she shared:

Group projects sucked. It was absolutely terrifying. I was already the black sheep, outsider, in high school. I didn’t want people to know I have this accommodation or disability. I didn’t want people to see me as broken or as an outsider. I didn’t want anyone to see me as worse.

During Interview 2, she said she was “already the black sheep” as the only Asian student attending a predominantly White school that bullied and chastised her for outwardly displaying her Asian heritage. She was concerned about the additional stigma she would carry if her peers became aware of her label as a dis/abled student, an additionally stigmatized identity. She described the unwanted identities associated with disabilities: “outsider,” “broken,” “worse.”

Participants described schooling environments where Whiteness and able-bodiedness were “sites of normativity” (Annamma & Morrison, 2018, p. 918). Their identities as dis/abled students of color positioned them as different from their peers and perpetuated deficit framing. MJ described, during the third interview, how this positioning contributed to her marginalization, saying:

High school math class is designed for people who are good at it. Because a lot of times you could usually see, at least in my experience, you could always know, you could always feel when you’re a part of the group that was like, “Okay, yeah, they’re not going to get it” or like,” they’re going to be the ones that are going to turn this in late,” or “they’re going to be the ones that are going to fail this test.” I felt like it was kind of just meant for people that already knew what they were
doing. Because everyone else who didn’t know what they were doing kind of just got put off to the side.

**Implicit and Explicit Bias**

The participants described various forms of implicit and explicit bias that the adults and peers held toward dis/abled students and toward students of color. The various forms of implicit and explicit bias differed based on the unique social identities that the participants carried and their social context.

BB, a self-identified “Hispanic” student with Autism, described during her initial interview how implicit and explicit bias in the classroom contributed to a learning environment that compelled her to follow normative ways of being, saying:

I didn’t have a lot of problems with the content. I enjoyed math. I would spend all of the class trying to understand the social rules and trying to negotiate talking to people, instead of spending the time focusing on learning actual math. . . By the time I got to the actual math work we were supposed to be doing, I was so tired. I felt like I was stepping into an environment that was designed to be comfortable for other people at my expense. Like I had to be uncomfortable so that the other people in the class wouldn’t have to be. And that’s really frustrating when you’re just there to learn. I just wanted to learn math.

Existing literature described how the schools operate in problematizing differently abled students, rather than problematizing the environment; the burden is on the individuals to fit into the existing school model (Bagger et al., 2020; Baglieri & Knopf, 2004; Cosier & Pearson, 2016). Explicit and implicit biases that adults and schools held worked to uphold problematizing the student rather than the environment.
MJ and James both described experiences of teachers’ reluctance to help them because of internally held bias that they were not trying hard enough. James, a multigenerational Japanese American diagnosed with dyslexia, described during the second interview how he often felt that he was “at the mercy of adults” at his school as to whether they would take the time to understand his situation and offer support. He recognized the power that educators’ and adult educational personnel had to either “dislocate or reaffirm oppressions” (Annamma & Morrison, 2018, p. 917). The “model minority” discourse that circulates within U.S. society implies that Asians “embody diligence, respect for education, and self-sufficiency” (Shah, 2019, p. 667). Most of the adults at his school ascribed his low academic performance to James’ lack of effort. Only one teacher took the time to talk to James and his family about testing for a learning dis/ability.

MJ, a Mexican-American, described during the second interview how the adults at her school often neglected to support her and instead cast her off as a “misbehaving” student, saying:

I was treated even more like, “Oh, you’re just misbehaving, you just don’t want to try or you’re just lazy.” And so, I feel a lot of times my experience, for the majority of my educational career, especially in math, my experiences were kind of bad because I was just treated as other and I never really experienced people trying to actually help me and help me try to understand things or try to make things understandable for me or they didn’t try to change the way they taught it to me even though they saw that it wasn’t working.

MJ’s comments described a need and desire to be authentically cared for by the school; yet, she was dismissed because of implicit bias that teachers held perceiving her as a
misbehaving and lazy student. Valenzuela (1999) documented in her ethnographic study on Mexican-American youth documented how school personnel often interpreted students’ “off-putting behavior” (p. 18) as evidence that students do not care and reacted by forgoing any attempt to develop a caring relationship with the student.

Teacher bias and actions can filter into how students perceive themselves, damaging their beliefs in perceiving themselves as mathematicians (Mercer & Moses, 2019). Teacher and peer explicit and implicit biases toward participants were often rooted in rigid conceptions of mathematical learning and understanding.

Rigid Conceptions of Mathematical Learning

The participants described rigid conceptions of mathematical learning such as meritocratic beliefs that individuals must succeed without assistance (e.g., Cobb & Russell, 2015), a curriculum not connected to their lived experiences, and an acceptance that learning is to be achieved rather than a process (Annamma & Morrison, 2018). These rigid conceptions of mathematics fostered a negative learning experience for participants.

Meritocratic Beliefs. The participants described how teachers and students questioned the need for their accommodations. For example, during Interview 2, BB described an experience where her peer disqualified her success because she received accommodations: “Whenever I would do better than other people in the class, they would say, ‘oh, but your score doesn’t really count because you get extra time, right?’” Her peers did not question the arbitrary and disabling belief that demonstrating mathematical understanding in a timed environment is an accurate method to assess the ability of all students (Lambert, 2015). Instead, the peers adhered to a meritocratic belief that success should only be achieved without assistance and when peers receive explicit forms of assistance such as extended time, their success is invalidated.
Carina, an adopted Chinese-American with an identified learning dis/ability, began to see herself as a mathematician when she earned 100% on the standardized California High School Exit Exam. She internalized this meritocratic belief that she did not earn her success because of the accommodations that she received, and during Interview one shared, “Sometimes I wonder, am I actually smart or do I just have good grades because I had that extra time?” She began to question her success in mathematics because of the learning accommodations she received as a dis/abled student.

**Learning Is to be Achieved.** Grades and assessments became a determining factor in whether participants saw themselves as mathematicians. Participants in the study mentioned their grades in every interview. During Interview 1, James explicitly responded during his interview that math was a positive experience “was reflected by his grades.” MJ adhered to a belief that she was a failure and could never do mathematics because of her low grades on mathematical assessments, and during Interview 1 shared, “I ended up seeing my grade, and I completely failed it. I actually tried so hard, and I still failed. Why do I even try? I’m going to fail regardless.” Because of her consistent failure on mathematical assessments, MJ never saw herself as a mathematician and carries negative memories of her mathematical experiences. Yet, MJ was the only participant to use a mathematical representation—a line graph—to represent her educational journey.

During Interview 1, Ariel described why she began to “hate” her mathematics teacher, who would “give me bad grades on tests and the homework” and sometimes “would get her in trouble for no reason.” Teachers were the arbiter of truth in deciding whether students were mathematicians. They decided what counted as mathematical knowledge, how it should be taught, and how it should be assessed.
Limited Curriculum and Pedagogy. BB and James described positive experiences with the mathematical content itself because the mathematics focused on conceptual understanding of mathematics. During Interview 1, James said:

(Math) was positively reflected by my grades. Conceptually, it makes sense. Spelling and other stuff, you needed to know it or memorize it or to do it. But math, I could actually learn and talk through it and do examples, and it’s not memorization of number sequences, but memorization of concepts. And I’m a big concept person; I understand human nature is to ask why but I’m big on why is it happening? What’s the purpose of this? Why am I finding the square root? Because the square root takes out the exponent of that, so you can find the linear and not the exponential. I’m big on knowing why.

James experienced learning mathematics in a way that allowed him to understand why rather than a focus on regurgitating procedural steps dictated by the teacher. BB similarly appreciated how her mathematics curriculum fostered self-directed learning by guiding her to “intuit the mathematical concepts” as she stated during Interview 1. Rather than the learned helplessness that some mathematics students adopt because of the traditional “I do, we do, you do” format of mathematics classrooms (e.g., Borgioli, 2008), BB was able to understand the mathematics concepts without relying on the teacher independently. However, she still expressed frustration with the ways that teachers expected her to show her work during Interview 2:

I had a couple of teachers who would mark your homework or tests wrong if you did a problem a different way than they showed it, but you still got the right answer. If I went and looked for a way of doing things that made more sense to
me, I had to pretend I was doing it the way the teacher showed me, or I wouldn’t get full credit.

However, for MJ, the lack of a culturally relevant curriculum was frustrating. Mathematics learning was instead framed as a problem to overcome rather than a subject area that could further enlighten her and her peers about their communities, the world, and themselves, and said during Interview 1, “it’s taught one singular way, and it’s never adjusted to its demographic. That’s where I think the disconnect comes from a lot of the time.”

Teachers’ inability or refusal to adjust their instructional strategies to meet the needs of the students can contribute to debilitating multiply marginalized students (Anamma & Morrison, 2018; Banks, 2017). Ariel described during Interview 1 how visuals in mathematics allowed her to understand the concepts more since she otherwise “needed things to be repeated multiple times” because of her disability. Certain ways of presenting mathematical content can enable or disable students (e.g., D’Souza, 2016).

**Research Question 2: How Do Dis/abled Students of Color Resist the Normalizing Process of Racism and Ableism in the Mathematics Classroom?**

All of the participants resisted forces of ableism and racism in their educational journeys by “(re)positioning themselves” to maintain their integrity (Anamma, 2020, p. 19). The participants described various strategies they used to navigate their oppressive schooling experiences that were categorized into self-defeating, conformist, and transformative resistance strategies (Solorzano & Bernal, 2001).

**Self-Defeating Resistance**

Self-defeating resistance refers to the students who may have a compelling critique of their oppressive learning environments and social conditions, but their actions taken in response
to those conditions are self-defeating. They do not contribute to positive social change (Selgado & Bernal, 2001). Several participants described various forms of self-defeating resistance, such as not using their accommodations, internalizing their deficit narratives, and refusing to participate in class.

Ariel described her behaviors learning mathematics in the class where she had to repeat Integrated Math 1 for the third time. In response to her learning environment where her peers would pick on her, she chose to not participate in class. In Interview 1, she said:

I didn’t like to talk to people. I would get picked on. I didn’t go well with them. I didn’t like either of them. When I would get picked on in class, everyone would stare at me or say something. Or I thought they would say something. I wouldn’t talk unless I had to. I did the work on my own, and I wouldn’t ask the teachers either because it was just embarrassing getting the attention in front of everyone. They would just look at you.

She described an unwelcoming learning environment where her peers “stared” at her; she did not have positive relationships with her peers or teachers and felt singled out in class. Ariel responded to those conditions by shutting down. While she critiqued the conditions of an unwelcoming learning environment, her resistance was self-defeating. She chose not to ask questions in class, not collaborate with her peers, and not participate in class discussions. Her actions inhibited her mathematical performance and furthered the narrative that she was not a successful mathematician. Some participants internalized this deficit narrative that dis/abled students of color are less capable or do not belong.

Carina described a mathematical learning environment where her peers otherized as students of color. Out of concern that her peers would perceive her as dis/abled, Carina described not wanting to use her accommodations during Interview 3, saying:
I wanted to be like everyone else. But then I’m just screwing myself in the end. I would take a test in class or a quiz in the same timeframe (as everyone else), and I wouldn’t finish and get a bad grade. I would be mad at myself because I knew I wasn’t going to finish it to the best of my ability.

Carina described an unwelcoming learning environment (Irizarry et al., 2021) that problematized her identity as a student of color and as a dis/abled student. She wanted to be like everyone else and chose to take the test without using her extended time accommodations. She internalized the belief that needing help or being different from others is problematic.

James also demonstrated self-defeating resistance by describing various forms of internalized ableism (Campbell, 2008). Internalized ableism is the “emulation by dis/abled people of ableist norms,” such as the belief that dis/abled people are inferior to nondisabled people (p. 155). Throughout his interview, James described feeling embarrassed and ashamed of his diagnosis of dyslexia. While the diagnosis provided a legal means through which he could compel educators to provide meaningful and supportive accommodations that would allow him to succeed, he chose to keep his identity as an individual with a disability discreet. During Interview 1, he shared:

I was always really embarrassed telling people. . . It was just embarrassing. . . I just remember thinking, “I don’t want to be known as that kid.” I don’t even know what “that kid means,” but I just didn’t want to be different. And I didn’t want to have others think, “What going on with him?” To this day, it’s just something I want to keep to myself.
James internalized the belief that to be different, mainly because of having a disability, is inferior and should not be shared with others. Later in Interview 1, he challenged the belief that his dyslexia can be fixed or cured when he described his reaction to his grandparents sending him reading materials on curing dyslexia: “they sent me so many books and audio tapes of pretty much how to fix me. And like, you know, for lack of better words cure it and, I don't think they really understood that that's not how it works”. While he understood that his disability is a part of who he is, he struggled with disclosing his disability with others.

This strategic maneuvering by participants operated on two fronts: to pass as “normal” and to counter assumptions about their identities. Other participants chose to keep their identities as dis/abled students on a need-to-know basis between themselves and their teachers. Campbell (2008) described the “distancing of dis/abled people from each other” as another form of internalized ableism (p. 155). Their choice to hide their identities from others acknowledged the narrative that having a disability is a source of shame and embarrassment.

Dewey described during Interview 1 how they avoided disclosing their identity as Latinx because of internalized beliefs that Latinx students “don’t try hard, don’t do well in school, don’t go to college, are in the lower class.” Dewey was able to pass as a White student to others, and commented during Interview 1, “no one knew I was that race, but I knew I was.”

Passing allowed participants to maintain a perception that they were “normal,” as stated by James during Interview 1, and “like everyone else” as commented by Carina during Interview 3. However, it also allowed them to strategically counter deficit assumptions about their identities as dis/abled students and students of color.
**Conformist Resistance**

Conformist resistance describes student behavior motivated by social justice and creating positive change in themselves and others (Solórzano & Bernal, 2001). However, the student lacks a critique of the oppressive environment, such as specific “institutional practices, pedagogy, and curriculum, or other socioeconomic factors” (Solorzano & Bernal, 2001, p. 319). Instead, the students often blame themselves, their community, or their culture for their social conditions. The participants in this study’s use of legally granted learning accommodations demonstrated their conformist resistance. For example, in response to a question about advice to other high school students, Carina advised on the personal responsibility of using the learning accommodations, during Interview 3 she told me:

Take advantage of the accommodations. . . There was a reason it (the accommodation of extra time on assessments) was provided. If I’m not using it, then the bad grades that result from it, that’s on me. I can’t blame anyone else because it was my decision based on my ego not to use it.

Rather than question or challenge a mathematical learning environment that dictates all students must demonstrate understanding in a prescribed and often arbitrary amount of time, Carina advised students to take advantage of the extended time accommodation. While such advice would improve the social conditions for herself and her peers via improved grades, it does not challenge the root cause of an ableist mathematical learning environment that required such learning accommodations to access the material (e.g., Borgioli, 2008; Lambert, 2015).

For the participants, ensuring their access to an equitable learning environment is a personal responsibility where individuals need to be proactive in communicating with the
teachers. BB said during Interview 3, “you have to do the pesky things that we’re talking about like ask questions, get accommodations, or show your work the teacher the taught it.”

During Interview 1, Kirby critiqued the mathematical learning environment where mathematical content was only taught in a specific way that often did not make sense. Her response was to hire a private math tutor who could provide an alternative, often visual, understandings of the mathematical concepts.

In Kirby’s situation, as well as for James, their families socioeconomic status gave them access to private, privileged resources that the school otherwise did not provide. Kirby was able to hire a private mathematics tutor, and James was able to hire a private doctor to evaluate his learning dis/ability. Their socioeconomic status allowed them to circumvent barriers to their education. Their resistance strategy allowed them to advance their own academic success but lacked a critique of a school system that maintained socioeconomic barriers to learning.

**Transformative Resistance**

Transformative resistance describes student behavior motivated by a desire for social change and a strong critique of oppressive conditions (Solorzano & Bernal, 2001). Although the participants in this study had yet to participate in “political and collective” forms of resistance (Solorzano & Bernal, 2001, p. 320), the participants’ counter-stories described other forms of transformative resistance: proving others wrong, surviving the educational pipeline, and demanding change in schooling conditions.

**Surviving the Educational Pipeline.** All the participants in the study successfully navigated the mathematical educational pipeline in high school. Their success challenges the dominant narrative that the multiply marginalized students cannot successfully navigate high school. MJ was able to successfully navigate such school conditions while maintaining a critique
of her oppressive schooling environment illustrates transformative resistance. During Interview 3, MJ strongly critiqued the schooling conditions that positioned her as “the other.” The mathematics curriculum did not connect to her own lived experiences, during Interview 1, she shared, “even though the school was predominantly Mexican or immigrant population, the curriculum was never tailored to us.” However, she felt compelled to persist through the oppressive mathematical learning environment to pursue her other passions. She successfully proved the adults who labeled her as “not trying” and “lazy” wrong by successfully passing her mathematics classes. Their success challenges the deficit narrative that dis/abled students of color are less competent or likely to succeed in high school. Furthermore, all participants successfully enrolled in postsecondary institutions, with several, James, BB, and Carina, pursuing degrees in STEM fields.

**Acceptance of Their Identities.** Participants acknowledged an acceptance of their identities as a dis/abled student of color, particularly in response to critiques of their learning accommodations from peers and teachers. During Interview two, she stated:

I just learn differently, so I have to do the material differently and be tested differently or in a different way. . . Me getting extra time is just trying to level out the playing field because I already have to work 10 times harder than you (nondisabled peer) do. It’s not a luxury to me. It’s an adjustment to try and make things doable.

MJ acknowledged the inequitable school conditions that privilege certain abilities and ways of thinking over others. She resists critiques that the learning accommodations she receives are an undue advantage and instead demands access to those accommodations as a means of ensuring her access to the learning. The school system was not designed for her to succeed: “it was treated as one size fits all. A lot of people in my position, especially people who had
disabilities struggled more than everyone else in the math program” as she mentioned in Interview 1. However, it is the school system—the assignments, assessments, and environment—that needs to change, not her.

Dewey similarly described a radical acceptance of their identity as a dis/abled student. During the final group interview, in response to a question posed about advice to students who were newly identified with a learning dis/ability, Dewey responded, “Congratulations, you’ve learned something about yourself.” Disability and race are not identities to remain unacknowledged. Rather, these identities are part of their identity, and it is important to learn about and accept those parts of themselves. DisCrit scholars reject the assumptions that those who are perceived as deviating from standards of Whiteness or ability necessarily want to achieve those standards (Annamma et al., 2013).

MJ and Dewey did not describe themselves as inferior to others because of their dis/ability (Campbell, 2008). Instead, they repeatedly affirmed that the learning environment that must change and not themselves.

**Demanding Change.** For all participants, sharing their experiences, validating each other’s experiences, and expressing their hopes for how mathematics education should change demonstrated transformative resistance. These participants chose to participate in this study and share experiences that they admit they never shared with anyone else. Each participant described ways that mathematics educators and the school system can be more inclusive of dis/abled students of color. They spoke back to a dominant narrative that placed the burden on them to change in response to the learning conditions.

During the final interview, Carina and MJ both advised mathematics teachers to differentiate their instruction for students either by explaining the mathematical concepts in
different ways, using flexible grouping, and being open to changing teaching methods if students are not successful. In the same interview, James and Kirby suggested that mathematics educators take the time to get to know the students and their situations. Rather than jumping to negative conclusions about a student’s behavior or intentions, teachers need to try to understand why a student is not successful rather than assuming “they just don’t care” as stated by James during Interview 3. Educators need to show compassion—not pity—in a “carceral system” of schooling (Annamma, 2018).

During the final interview, BB suggested that mathematics educators do more to plan for their students, specifically for any accommodations like a separate testing environment, rather than placing the responsibility on the student or the resource coordinator.

Dewey, the last to share advice, agreed with the rest of the participants and expanded on a critique of the overall educational system, and during Interview 3, said:

Education, in general, can be improved. Right now, the US education system works from a top-down system where there are certain things you have to learn, and the teachers force them onto you. Whereas if students’ curiosities led school, what they learned and how they learned it, everything would stem from the student. Education needs to be customized and the student should decide what they want to learn and how they want to learn it. Teachers would just help them.

Dewey demands an educational system that is a collaborative learning environment between students and teachers. Such collaboration can contribute to an anti-deficit learning environment where students are at the decision-making table speaking for their needs and wants, rather than having those needs and wants decided for them (Irizarry et al., 2021).
Conclusion

As seen in this chapter, participants shared their counter-stories as dis/abled students of color learning mathematics and navigating the school system. Their experiences highlight the complex and nuanced descriptions of normalizing forces in the mathematics classroom that marginalize dis/abled students of color. They also described various methods of resisting those normalizing forces as they successfully navigated the educational pipeline. Chapter 5 reconnects with the theoretical framework that grounds this study, Dis/Crit, to expand on implications for future research around equitable mathematical learning experiences, methodological approaches, and implications for mathematics educators.
CHAPTER 5: DISCUSSION

The purpose of this study was to reposition dis/abled students of color as knowledge generators whose counter-stories challenge the majoritarian narratives of belonging, ability, and resistance in the mathematics classroom. This chapter expands on the significance of the findings using the intersectional lens of disabilities studies in education and critical race theory (DisCrit). I then discuss future the implications of this study’s findings on the field of mathematics education and future research.

DisCrit and Equity in Mathematics Education

Inequities in mathematics education for multiply marginalized students have remained entrenched for decades despite calls for increasing access and equity (e.g., Padilla & Tan, 2018). The intersectional theory of disabilities studies in education and critical race theory (DisCrit) provided a framework for understanding and dismantling the oppressive structures in schooling, specifically in mathematics classrooms, that work to marginalize students who deviate from the normative center. DisCrit helped to unpack how race, racism, ableism, dis/ability are “built into the interactions, procedures, discourses, and institutions of education” (Anamma et al., 2016, p. 14).

Interdependence of Racism and Ableism in the Mathematics Classroom

1. DisCrit focuses on ways that the forces of racism and ableism circulate interdependently, often in neutralized and invisible ways, to uphold notions of normalcy (Anamma et al., 2016, p. 16).

The interdependence of racism and ableism should be understood not as exploring the different forms of oppression separately but instead as exploring the interconnectedness among different forms of oppression (Fenton, 2016). Racism reinforces ableism, and ableism reinforces
ableism. However, even those who are multiply marginalized may emphasize a specific aspect of their identity when that label provides them the greatest authority in their context (Fenton, 2016).

This study aimed to understand how ableism and racism circulate in the mathematics classroom to uphold normative ways of doing, learning, and being in a mathematics classroom. Throughout the interviews, most of the participants primarily described how their label of a disability mediated their learning in the mathematics classroom. They often only mentioned their race when explicitly prompted during the interview. This focus on their dis/abilities may be attributed to how their label of the dis/ability provided them with explicit markers of their identity as a dis/abled student. Once they received their Individualized Education Plan (IEP), the participants were granted specific learning services in the classroom. For most of the participants, the IEP fundamentally impacted their learning experiences: having to speak directly with adult personnel on campus to ensure their access to learning services and strategically negotiating whether to disclose their differentiated status with their peers. Those concrete markers of their identity as a dis/abled student contributed to their hyper-awareness of their “otherness” learning alongside their mostly non-dis/abled peers.

This was particularly salient in the case of James, a multigenerational Japanese-American with identified dyslexia. After receiving his IEP during his 10th-grade year in high school, James described during his first interview navigating the emerging tension of attempting to pass as a “normal” nondisabled student among his peers while also ensuring that he had access to his learning needs from his teachers. He was hyper-aware of the negative perceptions of dis/abled students as he learned alongside non-dis/abled peers. He described how he never knew of any other dis/abled peers in his classrooms. Yet, as an Asian American student, James did not describe any explicit tensions with his racial identity. He ascribed this lack of tension to the
racial diversity of his high school where ethnic diversity was normalized but neurodiversity was not.

In contrast, Kirby—a fifth-generation Chinese American and 6th generation Japanese American—was the only participant where racism was at the forefront of her educational journey. Attending a school of mostly White students, Kirby described how her peers positioned her as a “forever foreigner” (Chen & Buell, 2018, p. 609) because she openly displayed her cultural heritage. The additional identity as a dis/abled student compounded the otherness that she felt among her non-dis/abled peers, who already viewed her as not belonging because of her race. The explicit racism that she experienced from her peers compounded the negative impacts of her dis/ability. She resisted using her learning services at the risk of exposing her other deficient, different identity as a dis/abled student. She recognized how dis/abled students are viewed as inferior (Collins, 2013). Kirby’s experiences highlighted the interconnected nature of racism and ableism. If Kirby were White, she would not have already “felt like the Black Sheep” and may have openly accepted or disclosed her dis/abled identity by publicly accessing her learning services in front of her peers.

For some of the participants, their racialized experiences showed up in implicit ways in their descriptions of their educational experiences. Dewey, one of the only Latinx students in their advanced mathematics classes, did not disclose their racial identity to their peers and instead allowed their peers and teachers to perceive them as White. They were aware of the implicitly held deficit narratives that positioned Latinx students as “less able,” “lazy,” and “academically unsuccessful.” Ariel described during her first interview that it was always the Vietnamese students who were the top performers in her classroom of predominately Latinx
students. They described an awareness of how racialized identities impacted conceptions of ability in the classrooms.

**Multidimensional Identities of Dis/abled Students of Color**

2. DisCrit values multidimensional identities and troubles singular notions of identity such as race or dis/ability or class or gender or sexuality, and so on (Annamma et al., 2016, p. 19).

Tenet 2 of DisCrit highlights the multiplicity of identities for individuals and critiques the often unidimensional approach to understanding marginalized students’ experiences (Annamma et al., 2016). Rather than viewing an individual through a singular notion of identity such as race, gender, or ability status, DisCrit emphasizes the multidimensional nature of identities. Individuals hold multiple identity markers that provide complexities and nuances to their experiences.

All the participants self-identified as students of color; however, their specific racial identities added nuance to the ways they experienced their learning in the mathematics classroom. Furthermore, their self-described dis/abilities varied: ADD, ADHD, anxiety, depression, learning disability, auditory processing disorder, autism, and dyslexia. This study recognized the nuanced and complicated ways in which the participants’ individual and unique identity markers added nuance and complexities to how they experienced and resisted ableism and racism in the classroom. Researching within the DisCrit framework allowed embracing and addressing the various identities, experiences, and knowledge that the participants carried.

While Carina, James, and Kirby all identified as dis/abled and Asian American, their experiences with racism and ableism were not uniform. Their diagnosed disabilities and connections to their Asian American identity were unique. Carina, who was adopted from China
as an infant by a Chinese American mother and a Jewish father, described explicitly racist comments from her primarily White peers that pertained to the “smart Asian student” myth (Shah, 2019). Her peers mocked her success or nonsuccess in mathematics using the myth that Asian students are smart at mathematics. The smart Asian myth complicated Carina’s conception of smartness as she began to doubt her abilities because she used learning services for her dis/ability. James, whose mother is Japanese American and father is White, had Japanese grandparents who were interned in U.S. prison camps during WWII. They instilled in him the value of hard work to succeed and at one point suggested that he could fix or cure his dyslexia if he tried hard enough. His lack of academic success despite his hard work in school generated an internalized belief that he was “stupid” or “not trying hard enough” in his words.

Furthermore, as he learned about his dyslexia, he continued to attempt to hide the dis/ability from others to appear normal (i.e., nondis/abled). His educational experiences are reminiscent of the model minority myth (Chen & Buell, 2018; Shah, 2019), where Asian Americans embody the cultural values of hard work, diligence, self-sufficiency, and obedience. During Interview 1, James described trying to accept his dyslexia as not a disability to be cured but as part of who he is and his identity, challenging narratives that he did not work hard. Instead, he tried to ensure that his teachers provided the learning services he required to ensure that he could access the learning.

Kirby also described explicit and violent forms of racism from her peers as they mocked her Chinese and Japanese heritage and physical appearance. She was ostracized from the primarily White school community because of her Asian-American identity. She outwardly expressed her Asian-American identity in school by speaking Chinese and Japanese phrases at school and celebrating the Lunar Year. She struggled with accepting her learning services in
class that would provide her access to the curriculum because of an auditory processing disorder. She did not want to be perceived as “broken” in addition to being the “black sheep” among her peers as she commented in Interview 2.

While Carina, Kirby, and James all self-identified as dis/abled Asian American students, their unique identities and experiences contribute to their complex and nuanced experiences with racism and ableism in their educational journeys.

MJ, BB, Dewey, and Ariel all may be perceived as Latino or Hispanic, but they self-identified in various ways. When MJ described how she self-identified, she attended to the myriad of cultures in her lineage: Spanish European as well as indigenous roots in Mexico and California. Yet, she recognized the institutional constraints to choose a singular identity where she self-identified “on government forms” as either Hispanic/Latino or Native American as she expressed in Interview 1. With her peers, she considered herself Mexican. She stood firmly against identifying as White and described specific experiences where she resisted the subtractive forces in school that compelled her to ascribe to Whiteness (Valenzuela, 1999). She kept her hair curly during school pictures as she recalled in Interview 1. She critiqued the Eurocentric curriculum that never attempted to connect the learning to her predominantly non-White, primarily Mexican American peers.

In contrast, Dewey self-identified as “half White and half Brazilian” during our first interview. They described experiences of passing or claiming Whiteness as a means of accessing the educational affordances provided to White peers. Their Brazilian mother was perceived as White by school administrators and teachers. Dewey and their mother never challenged this perception of Whiteness. They implicitly recognized the stigma ascribed to Mexican American
or Latino students and parents and the affordances of White privilege in the educational system (Bernal, 2002).

While other identities such as a class, gender, and immigration status were not the primary focus of this study, the participants’ described other identities impacted their educational journeys. Beyond their racial and dis/ability identities, the participants’ class identities also added complexity to their experiences learning mathematics. Kirby and James described how their families were able to afford access to resources that mitigated the negative impacts of their learning experiences. Kirby was able to hire a private tutor and James was able afford a private doctor who diagnosis of dyslexia. These were services their schools denied; yet, they were able to access because of their class status.

Dewey was the only participant to explicitly name how having a higher socioeconomic status can afford certain students privileges that other students cannot access. Such privileges often remain hidden causing, in the case of Dewey, a belief that asking for help or accessing external resources is a form of cheating.

The attention to multidimensional identities of students challenges conceptions of essentialism (Gutiérrez, 2013), where individuals are perceived through a singular lens of their identity. Recognizing and embracing the multidimensional identities of students highlights how identity is “fluid, complex, multivocal, and contradictory” (Gutiérrez, 2013, p. 52).

**Impacts of Being Labelled as Raced or Disabled in the Mathematics Classroom**

3. DisCrit emphasizes the social constructions of race and ability and yet recognizes the material and psychological impacts of being labeled as raced or dis/abled, which sets one outside of the western cultural norms (Annamma et al., 2016, p. 19).
DisCrit recognizes the social construction of race and dis/ability as society’s response to perceived differences from the norm. The participants described how their labels positioned them as deviating from the normative center—White, nondisabled, English speaking (Annamma et al., 2016). Hegemonic beliefs as well as the discursive schooling practices of tracking (Oakes, 1997), teaching methods (Greenstein & Baglieri, 2018; Lambert, 2015), and interactions (Collins, 2013) uphold this normative center about ability (Baglieri & Knopf, 2015; Borgioli, 2008; Collins, 2013; Lambert, 2015) and race (Hogan, 2008; Louie, 2018; Martin, 2019; Shah, 2019).

The cultural and historical context around mathematics education helps to explain the narrow definitions of mathematics that have been used to justify the exclusion or othering of students with different abilities. Mathematics is “not neutral or natural” as even the taken for granted equal sign/symbol embodied in mathematical learners “works to govern a logic of equality that produces and maintains representations of children as objects that can be measured, compared, and calculated so as to be included in the all” (Yolcu & Popkewitz, 2019, p. 48). The use of cognitive tests normed around narrow definitions of mathematics has been used as a “vehicle for measurement and sorting” of students, often privileging White, nondisabled children (Yeh et al., 2020, p. 4). Western notions of mathematical learning as decontextualized and learned through “linear, developmental progression” marginalize individuals from different cultures who instead view mathematical learning as rooted in people’s experiences, ideas, and conditions (Yeh et al., 2020, p. 4). Researchers need to understand disabled individuals’ cultural ways of being and acknowledge their different ways of learning and understanding mathematics.

However, recognizing the social construction of race and dis/ability does not negate the significant impact of those identity markers on individuals’ lives (Annamma et al., 2016). The
labels of being non-White and dis/abled in the mathematics classroom had both material and psychological impacts on the participants in this study.

Materially, the participants all described how the label of the dis/ability allowed them to gain access to legally protected learning services that increased their access to mathematical learning. They all described the various learning services that teachers were required to provide, including but not limited to separate testing environments, modifications to assignments, and extended time on assignments and assessments. While the physical placement of dis/abled students of color in a segregated learning environment is well documented (Borgioli, 2008; D'Souza, 2015; Lambert, 2015; Tan & Padilla, 2017), all participants in this study described learning in inclusive settings alongside their nondis/abled peers.

Although the label of the dis/ability may have afforded the participants material advantages through access to learning services, the participants all described the negative physiological impact of the label of being dis/abled that constructed them outside the boundaries of a “normal” student. BB and Carina specifically described how they began to question their abilities and success, attributing their academic success to their learning services than their skills or abilities. The cultural and historical hegemonic practices in mathematics education reify the belief that individual hard work leads to success in mathematics (Borgioli, 2008). This belief complicated their perceptions of their abilities when they were afforded learning services that their nondis/abled peers did not have. Meanwhile, James actively attempted to hide his learning dis/ability from his peers as he recognized the stigma of being perceived as different by his peers. He was unaware of any other dis/abled students in his class. His only interactions with known dis/abled students were when he took his tests in a segregated space designated for other students who received a separate testing environment accommodation.
Furthermore, the additional identity of being non-White contributed to some of the participant’s marginalization by further constructing them outside the boundaries of “normal.” As dis/abled student of Chinese and Japanese heritage, Kirby experienced the compounding marginalization of “ability profiling” (Collins, 2013, p. xiii) and racial profiling. Kirby was already perceived as the “black sheep” among her White peers as she mentioned in Interview 2. She did not want the additional unwanted identity of being “broken” or “different” because of her label as a dis/abled student she shared during Interview 2. She was hyper-aware of the process of “ability profiling” where her peers and teachers would view all of her actions through the lens of deficiency because of her label as a dis/abled student (Collins, 2013, p. xiii). She was also racially profiled as a “forever foreigner” by her peers when she was the only Asian American among her White peers, openly displaying her cultural heritage (Shah, 2019).

Similarly, Carina’s experience highlighted how the social construction of race through the “Asians are good at math” myth and social construction ability through the discursive practices of tracking and grades impacted Carina both materially and psychologically. She described specific experiences with the false Asians are smart myth (Shah, 2019). This myth that Asians are good at math compounded her feeling of otherness in the classroom as a non-White and as a dis/abled student learning alongside mostly White, nondis/abled peers. Furthermore, the racist perception that she was only good at mathematics or should be good because she was Chinese complicated how she perceived her abilities. She internalized ableist notions that receiving learning services made her a cheater.

Furthermore, the discursive tracking practices and grades that socially constructed ability further complicated her conceptions of ability. Because she was tracked in the nonadvanced mathematics courses and at times earned low grades, she felt she “did not live up to” the
expectations of the “smart Asian student” as she mentioned in Interview 1. She began to internalize the social construction of the Asians as needing to be “smart.”

**Connections to Broader Context**

4. DisCrit considers legal and historical aspects of dis/ability and race and how both have been used separately and together to deny the rights of some students (Annamma et al., 2016, p. 19).

Vital to this critical phenomenological research is placing the findings in the historical, legal, and ideological contexts in which they exist (Annamma et al., 2016). All participants successfully navigated the ableist and racist practices of hyper-labeling, bias, and rigid conceptions of mathematical learning rooted in historical and cultural beliefs of intelligence. They all attributed their academic success to the legally mandated material supports that their IEPs afforded them. The Individuals with Disabilities Education Improvement Act (IDEA) benefits dis/abled students of color to receive specialized learning services. However, the legally mandated services do not account for the historically and culturally rooted practices of “segregation, stigmatization, and debatable quality of educational outcomes” that dis/abled students of color often face (Annamma et al., 2016, p. 23). The gains for dis/abled individuals granted by the IDEA did afford advantages to dis/abled individuals of color, but only because their interests converged with the needs of dis/abled White people. This concept of interest convergence (Bell, 1980; Zion & Blanchett, 2011) within the legal context of special education ensures that labeling a student with a dis/ability grants them more support in general education. However, it does not account for the historically and culturally rooted marginalization students of color face.
Situating this study in the historical, social, and legal contexts exposes the ways that the rhetoric of mathematics often disguises ableist and racist values. According to Annamma et al. (2016):

Dis/ability and race first became equated and molded through pseudo-sciences but later further cemented through “objective” clinical assessment practices. The dis/ability-race nexus was then reified through laws, politics, and programs until these concepts became uncritically conflated and viewed as the natural order of things. (p. 23)

Critical scholars highlight how modern-day assessment practices in mathematics education that are considered the natural order of things are rooted in a racist and ableist pseudo-science dating back to the early 1900s. Researchers proclaimed that non-White, specifically Mexicans, Blacks, and Native Americans, were biologically unable to succeed in the educational system (Ellis, 2008; Valencia & Solarzano, 1997). The biological explanation for the educational inequities was later replaced with cultural explanations of the educational achievements of non-White students, placing the blame on students’ families, cultural practices, and individual traits (Patton Davis & Museus, 2019; Solorzano & Yosso, 2002). Deficit thinking is rooted in racist and ableist practices and anchored in meritocratic and colorblind ideologies. These ideologies perpetuate the false belief that everyone has an equal chance of success in the educational system regardless of racial or classist inequities (Patton Davis & Museus, 2019). The participants’ descriptions of internalized beliefs about their abilities and smartness reflect this meritocratic ideology that pervades the U.S. school system.

At times, participants in this study attributed their lack of academic achievement to a lack of individual effort. This belief was reified by school personnel who perceived them as lazy or not trying hard enough when they were not succeeding academically, as was the case of James
and MJ. The school personnel located the problem within the students rather than problematizing a learning environment that did not accommodate their specific learning needs or identities.

Craniometry—or the study of human skulls—was used during the early 1900s to establish a racial hierarchy that placed White people at the top, superior to people of color (Takezama, 2011 as cited by Shah, 2019). The hegemonic belief in the superior intelligence of White people often remains unchallenged today. Dewey and Carina both described how their advanced mathematics classes comprised predominantly White and Asian students. Dewey specifically described how they hid their identity as a Latino student to avoid the unwanted identities attributed to Latino students; they said during Interview one: “There is this belief that.. Mexicans don’t try hard, as hard it is for me to say this, that they don’t do well in school, don’t go to college, are in the lower class.” She described how they could avoid disclosing their ethnicity by passing as White and accessing the privileges afforded to those who are perceived as White.

Implications for Mathematics Practitioners

Mathematics education exists as a contradiction in that while it has the power to oppress and marginalize individuals, it also has the potential to “emancipate and empower” (Solorzano & Yosso, 2002, p. 26). Educators have the power to either dislocate or reaffirm oppressions; they have a powerful part of the learning ecology of students (Annamma & Morrison, 2018). Participants described how educators chose to “reaffirm” rather than “dislocate” Whiteness and able-bodiedness as “sites of normativity” (Annamma & Morrison, 2018, p. 918). Educators need to dissect the racist and ableist practices animated in the mathematics class.

Educators often avoid engaging in this critical praxis because of discomfort and pain in acknowledging their roles in such oppressive learning environments (Annamma & Morrison,
As BB described during the second interview, students experience pain and discomfort daily in a space not designed for their success. Educators cannot shy away from moving toward that discomfort when students go through that every day. They need to unpack their implicit bias by reflecting on “what mental shortcuts (am I) using to judge multiply marginalized students of color the lead to system errors” (Annamma & Morrison, 2018, p. 118). For example, participants described helpful teachers as the ones who took the time to get to know their students and actively support their learning needs.

Furthermore, educators need to examine hegemonic values that uphold beliefs about normativity. In other words, mathematics educators explore how racism and ableism pervade their school and classroom structures in ways that enable some students and debilitate others. What are the everyday interactions, routines, and practices in the mathematics classroom that uphold rigid beliefs about who belongs in the mathematics classroom?

The participants described learning environments that stigmatized asking for help or demanding access to their learning services. While the needs of non-disabled students are often implicitly met in the classroom (Reinholz & Ridgeway, 2021), all the participants described working to ensure that their teachers met their access needs. Usually, this meant engaging in “inconvenient”- as BB said during the first interview- conversations with teachers after class or going to the administration when teachers would resist accommodating their legally mandated learning services. Instead, educators can normalize access needs through check-ins with students, eliciting anonymous feedback, and allowing for flexibility in instruction and classroom practices (Reinholz & Ridgeway, 2021).

Adults in school settings can respond to the diversity of their students in ways that contribute to an inclusive or exclusive learning environment for students of color (Baglieri &
Mathematics educators need to work to establish a learning environment “where student cultural diversity is not only acknowledged and accommodated but also welcomed and celebrated” through modifications to course content that fit students’ interests (Irizarri et al., 2021, p. 204).

Teaching is not about disseminating information but about organizing the learning environment (Mendoza et al., 2016). The blame for not learning is a shared responsibility when learning is “co-constructed by the student, teacher, and the social organization of the learning environment” (Mendoza et al., 2016, p. 83). For example, focusing on the correct answer to assess learning can limit teachers’ ability to evaluate learning. Instead, mathematics teachers should seek to understand the origins of the perceived wrong answers in the classroom and invite students to understand why showing or explaining their work is necessary. They should work to provide multiple ways for students to display their understanding.

Disabilities studies in mathematics education (DSME) scholars argue that all learners should be assumed to be mathematically competent as mathematical doers and thinkers (Padilla & Tan, 2017). Educators and researchers should focus on students’ strengths and abilities by valuing students’ contributions to the mathematical discussion (Sheldon, 2013; Tan, 2017b). DSME scholars also argue that pedagogical practices and curricula should position disabled students as mathematically competent. Teachers can take an active role in assigning competence by (a) publicly praising students’ smartness in the classroom (Louie, 2017); (b) using complex instruction to ensure equitable status in peer-mediated groups (Tan, 2017b); and (c) recognizing the multiple abilities needed in mathematics (Louie, 2017).

Finally, educators need to remain aware of the dangers of essentialism (Gutiérrez, 2013) in claiming that these certain practices should be generalized to an entire population of dis/abled
students of color. Just because students share the same ability status or racial category does not mean they are all basically the same. Rather than rely on a single characteristic of an individual to characterize their needs and experiences, educators need to acknowledge the diversity among all students and consider the various experiences, identities, and brilliance that each student brings to the classroom.

**Implications on Research Methodology**

This study used various approaches to collecting, analyzing, and presenting the data to counter traditional research methods that often perpetuate majoritarian narratives about dis/abled students and students of color. The use of critical phenomenological methods to collect the data through semi-structured individual and group interviews and Educational Journey Maps provided a rich data source. This method elicited data that constructed the participants’ counter-stories. These counter-stories can build community among marginalized students by humanizing educational theories and practices and demonstrating that they are not alone in their experiences. Furthermore, the counter-stories decentered Whiteness and able-bodiedness often at the center of traditional research, disrupting normative understanding of ability and resistance.

**Centering the Voices of the Multiply Marginalized**

As mathematics researchers and educators work to reimagine equity in mathematics education for students, studies centering on the voices and experiences of students are still emerging. There is a need for studies highlighting how dis/abled students of color, the “multiply oppressed” (Annamma et al., 2016), navigate, subvert, or resist the educational system that positions them as less than. The participants’ “experiential knowledge” of learning mathematics was a source of strength in this study as it is a “legitimate, appropriate, and critical” to social justice-oriented research (Solorzano & Yosso, 2002, p. 26).
By centering on student voice and experiences, DisCrit researchers intentionally investigate the ways students “resist” (Banks, 2017), “pragmatically strategize” (Ferri & Connor, 2010), and “maintain and defend their integrity” (Annamma et al., 2020). The participants in this study were not viewed as passive objects, experiencing their marginalization but as active agents, navigating an often-oppressive environment.

The participants’ counter-stories challenge assumptions about equitable practices in the classroom. For example, participants critiqued cooperative group work as an equitable or accessible instructional strategy as it often highlighted or exacerbated student differences. Without an explicit norm around valuing student differences or multiple perspectives or abilities, group work becomes another tool to reinforce normative ways of knowing and being. Furthermore, as the participants all learned in classrooms alongside mostly nondisabled peers, they all actively avoided being identified with a learning dis/ability. This avoidance on the surface may be understood as a means of attempting to appear “normal” to their peers. However, a closer analysis reveals the participants instead “strategically maneuvering” (Annamma et al., 2016, p. 21) to avoid the scrutiny from their peers for receiving learning services or counter the deficit assumptions about their identities as dis/abled or as a student of color.

This study does not give voice to the participants. They already have a voice. Instead, this study attempted to amplify their voices and perspectives that often go unheard or misinterpreted by researchers who claim to value objectivity. Majoritarian stories tell us that dis/abled students of color do not like math or are unsuccessful. Yet, these stories highlight how they succeeded, subverted, and even enjoyed learning math while critiquing the mathematical learning environment.
Virtual Data Collection

This study was the first time some participants had described or reflected on the meaning of their experiences with another individual. As participants went through the three-part interview process, they unpacked memories that they internalized and normalized. The interviews were an opportunity to talk back to the dominant narratives of students of color or dis/abled students that portray them as individuals who do not belong, need to be fixed, or are expected to fail. During the interviews, several participants indicated that participating in Zoom format where their identities were kept anonymous and hidden allowed them to share experiences and insights that they otherwise kept to themselves. As participants heard similar experiences from other participants shared during the group interviews, they expressed agreement and validation of those experiences in the Zoom chat with reactions such as “YES!” “SAME!” and “I feel you.” Listening to the experiences of others even triggered the recall of experiences that otherwise surfaced during their interviews. Storytelling is an act of liberation (Park & Stovall 2004). While the Zoom format may have increased participation for some participants by providing a more anonymous platform, the online format may have limited others.

The online video platform of Zoom limited the ways participants could engage in community building and relationship building. Most of the participants’ screens were kept off, with some participants displaying a profile picture. This lack of face-to-face communication that could foster more interpersonal communication among the participants may have been why one of the participants did not share as openly during the group interviews. Ariel was present during the two group interviews but did not respond to the participants’ sharing during the second interview and only wrote a few notes on the Jamboard during the third interview. She did not
share aloud during the final interview. During the initial interview, she shared that she needed to have a positive relationship with her group members to participate actively. If I were to do the data collection again, I would have asked the participants about their access needs (Reinholz & Ridgway, 2021) to participate in the group interviews. Instead, I assumed the access needs by providing a break during the interviews, providing live transcription during the Zoom meeting, and ensuring that the group followed the norms of the meeting space.

**Future Research**

DisCrit offers a framework to unpack the roles of racism, ableism, and other oppressive forces in the mathematics classroom that sustain inequitable learning. Future research using a DisCrit lens in mathematics education can investigate how do the social construction of race and dis/ability is used to justify segregating students in mathematics education. As schools move toward greater inclusion, DisCrit can offer a framework for unpacking how teachers and students address the diversity of the students in the classroom. Is the movement for inclusion merely a policy passed in the name of interest convergence (Bell, 1980; Zion & Blanchett, 2011), mainly benefiting White or White-passing dis/abled students in the name of equity for all? There are also opportunities for future research about participants, collaborative learning structures, and teacher education, as explained further next.

**Participants**

All the participants in this study successfully navigated the high school system by meeting the mathematics requirements to earn a high school diploma. Future research can replicate this study but instead highlight the counter-stories of dis/abled students of color who did not successfully navigate the high school system. Findings from such a study can further illustrate how high school mathematics classrooms specifically can dismantle racist and ableist
practices that continue to disenfranchise multiply marginalized students of color. Further research can replicate this study with students in other geographic regions of the United States, as this study only included participants who lived in the Western United States. This study also did not include any students who identified as Black. Their experiences may provide further insight into the discursive practices in the mathematics classroom that inequitable learning environments as well as the success strategies that dis/abled Black students use to subvert such practices.

Dewey was the only participant to self-identify as nonbinary and use “she/they” pronouns. Although this study focused primarily on the impact of race and ability identity markers, future research should investigate the interdependent, intersectional impact of other identity markers such as gender and dis/ability on students’ mathematical learning experiences.

**Collaborative Learning**

More research is needed to unpack how collaborative learning structures in the classroom, or group work, can perpetuate inequities rather than dismantle them. While researchers and practitioners often highlight collaboration in groups as a best practice for promoting equitable learning (Esmonde, 2017a), more research is needed to ensure collaborative learning environments can celebrate rather than problematize differences in student learning and abilities. How can educators build a classroom culture that embraces each other’s differences in abilities and identities and recognize the valuable contributions that such differences bring to the classroom ecology?

Critical researchers can expand on existing research of promoted equitable practices such as teacher noticing (Louie, 2018) and its impact on students’ collaborative experiences in the classroom. A recent case study of one high school Algebra teacher, documented how teacher
noticing can highlight the mathematical strengths of students from marginalized groups. Teacher noticing can also work to disrupt the ableist and racist ideologies that position minoritized students as deficient and therefore non-valuable members in a collaborative learning environment (Louie, 2018).

**Teacher Education and Professional Development**

More research is needed to support incoming and current educators in critical reflection on the role of mathematics education in operating as a form of liberation or oppression for historically marginalized students. DSME scholars emphasize the need for mathematics educators to specifically engage with dis/abled students rather than relegate the responsibility to Special Education (Lambert et al., 2018; Padilla & Tan, 2018; Tan, 2017b). Teacher education programs and school professional development programs should engage in critical reflection of their practice. How can teacher education programs support educators in critically reflecting on the ways racism and ableism circulate in the mathematics curriculum, instructional pedagogies, and interactions? What role do educators play in dislocating such practices? What types of curricular and instructional shifts can educators adopt that would highlight the brilliance of multiply marginalized students? How can mathematics educators unpack their implicit bias held toward multiply marginalized students?

Professional development resources have recently been made available that provide specific classroom practices and tools to create a more equitable mathematics learning environment for Latinx, Black, and Multilingual students (Math Equity Tool Kit, 2021). The exercises in this tool kit provide ways for educators to reflect on their own biases held towards students so that they can transform their educational practice. Research on teacher education can
investigate how such toolkits and reflective exercises impacted student learning in the classroom for dis/abled students of color.

**Limitations**

The first limitation of this study revolved around the limited number of participants in the study. A total of seven individuals participated in this study. While the study included students representing Asian American, Latinx, and Indigenous backgrounds, the study did not have any Black participants. Black students’ experiences may be unique compared with those of Indigenous, Latinx, or Asian backgrounds. Similarly, the study included only participants who held non-visible disabilities such as dyslexia, autism, attention deficit disorder, and other learning disabilities. Individuals with physical disabilities were not included in this study. Furthermore, all participants attended secondary schools in western United States. This study may not speak to students’ experiences in other country areas.

Finally, the interactions over Zoom may have been a limitation in that I had to build trusting relationships with the participants over a computer screen. Some participants kept their video off during the interviews, so I was limited to only their voice and Education Journey Maps when collecting data. I was limited in identifying moments of discomfort or distraction among participants and providing a timely break during the interview if needed. The Zoom format allowed some participants to share more openly because of the anonymous format. Several participants indicated that they were more comfortable sharing their experiences with the strangers in this study than with close friends and family. However, the format of Zoom virtual format may have been a limitation because it may have limited participants’ connections to each other, limiting the building of trust needed to disclose their experiences.
Final Thoughts

By highlighting counternarratives of dis/abled students of color with dis/abilities and how students challenge a dysfunctional (Annamma & Morrison, 2018) mathematical learning environment that perpetuates racism and ableism, this study unmask and exposes the ways that individuals resist the “business as usual” (Campbell, 2008; Stefanci, 2000) forms of ableism and racism that circulate in mathematics classrooms. Multiply marginalized students of color carry unique perspectives on the schooling environment because they have experienced implicit and explicit forms of oppression in the schooling system. Traditional methods of learning mathematics overemphasize methods that disable students who learn differently and enable students who can complete assessments in a timed environment, listen to and regurgitate mathematical instructions from the teacher, and fit the normative ideal of a student (i.e., White, nondis/abled). Mathematics education recognizes the inequitable outcomes for multiply marginalized students but too often does not listen to the voices of those students when investigating ways to disrupt the system that produces those inequitable outcomes. We need to build a caring community where we see the student holistically rather than seeing them for their deficits or differences. This is not a study that offers solutions or points out problems. Rather, this study pushes education researchers and educators to engage directly with the very stakeholders we are accountable to the students. For too many mathematics classrooms, outdated practices and beliefs about mathematical ability persist because we refuse to engage in critical consciousness.

My hope is that this study served and continues to serve in various ways to disrupt the educational inequities of students and establish a mathematical learning environment that ensures
that all students see themselves as mathematical learners and doers who thrive in a learning environment that values their identities and brilliance.
REFERENCES


http://hdl.handle.net/10481/21535


https://www.jstor.org/stable/jthought.43.1-2.131


https://doi.org/10.1177/1088357619827932


https://doi.org/10.1080/02680939.2014.983551


https://doi.org/10.1177/00224669030370031001


https://doi.org/10.1080/13613324.2019.1599343


https://doi.org/10.1177/2158244015626766

http://www.jstor.org/stable/1229039


https://doi.org/10.1080/13613324.2014.885422


https://doi.org/10.2753/EUE1056-4934450303

https://doi.org/10.1177/016146810811000603

https://doi.org/10.3102/0034654309332562


Ferri, B. (2010). A dialogue we’ve yet to have: Race and disability studies. In C. Dudley-Marling & A. Gurn (Eds.), *The myth of the normal curve* (pp. 139–150). Peter Lang Publishing.

https://doi.org/10.1080/09540250802612688


https://www.jstor.org/stable/40367921


https://doi.org/10.3102/0091732X16686950


https://doi.org/10.1080/19477503.2018.1467091


https://doi.org/10.1177/07419325060270020601


https://doi.org/10.14507/epaa.v13n38.2005


https://doi.org/10.1111/1467-9604.12142

https://doi.org/10.1080/19477503.2018.1463006


https://doi.org/10.5951/jresmatheduc.47.4.0338


http://www.wholeschooling.net/Journal_of_Whole_Schooling/IJWSIndex.html  
https://hdl.handle.net/11274/12111


Retrieved March 20, 2022, from https://equitablemath.org/


https://doi.org/10.1080/13613324.2019.1592833


In D. Connor, B. Ferri, & S. A. Annamma (Eds.), *DisCrit: Critical conversations across race, class, & dis/ability* (pp. 145–155). Teachers College Press.


Appendix A

Interview #1 Individual

Hello. Thank you for agreeing to participate in the study. I want to remind you that at any time in this interview you can ask to take a break or stop. All the information shared in this interview will be kept confidential; your identifying information will not be used in the write up about the study. Also, if you have any questions about the process, please feel free to ask.

First I’d like to go over the consent form. . . . Send the email to me with your signature now.

The purpose of this study is to investigate the math learning experiences for individuals who self-identify as a person of color and as a person with a disability. I want to know more about how your experiences learning mathematics in high school impacted your life after you graduated. I am a high school math teacher and I teach mostly students of color and students with disabilities. However, when I went to learn more about the research that would best support this group of students, I found that there was not much out there. In fact, there isn’t research published that focuses on students’ experiences and voices.

So, I’d like you to use this opportunity to really think about what obstacles you faced, what strategies you used to overcome those obstacles, what successes you felt, and what we can do to make mathematics learning a more positive experience for students of color, students with disabilities, and really all students. While this is an interview, I’d like you to really think of this as an opportunity for you to share your story.
We are about to start the interview, but again I’d like to remind you that you can ask to take a break at any time or to stop the interview. The interview will take about an hour. You may feel uncomfortable with answering some of the questions so if you’d like to stop or take a break that’s okay! We can also stop at any time and reschedule to a different time if you need. This interview is being recorded so that I can later study the data. The information is going to be kept confidential and anonymous.

Do you have any questions or thoughts before we start?

We can start with some demographic information:

1. When did you graduate high school?
2. How old are you?
3. Which math courses did you take in high school?
4. Which high school did you attend?
5. What classification was on your IEP? What did you qualify for?
6. What is your race and/or ethnicity (Check all that apply): Indigenous, Latino/Latina/Latinx, Asian, Pacific Islander, Black/African American, Middle Eastern or North African, White/European, Prefer not to state, Other

To start thinking about your mathematics learning experience, I’d like you to create a visual map of your educational journey. I’ll make mine too during this time.
Prompt for the Education Journey Map:

Map your education journey from when you started school to now. Draw your relationship with learning mathematics in school. Include interactions, conversations, people, places, obstacles, and opportunities on the way. You can include what works for you and/or what doesn’t. You can include what felt comfortable and/or what didn’t. What stood in your way and what helped you be successful. You can use different colors to show different feelings, use symbols like lines and arrows or words. These are just suggestions. Be as creative as you like and, if you don’t want to draw you can make more of a flowchart. Afterward, you will get a chance to explain it to me.

I’ll keep this prompt displayed while you create your education journey map. Can we start with 20 minutes and do a check in from there?

Guiding Questions for Semi-Structured Interview once participant is done with the journey map

1. How was that process for you?

2. “Tell me about what most stands out to you about your experiences in the high school math classroom.”
   a. “You mentioned _____ tell me what that was like for you.”
   b. “You mentioned _____ describe that in more detail for me.”

3. Did your disability have an impact on your mathematical learning in school?
a. If so, give an example of a time when your disability had an impact on your mathematical learning.

b. If not, discuss why your disability remained separate from your mathematical learning.

4. Did your race or ethnicity have an impact on your mathematical learning in school?
   a. If so, give an example of a time when your race had an impact on your mathematical learning.
   b. If not, discuss why your race remained separate from your mathematical learning.

5. Describe experience with mathematics or learning mathematics today/now.

6. (optional) Can you give me an example of when you have experienced this? (if participant expresses an opinion such as “My teachers disliked me.”)

Thank you so much for sharing your story and experiences. From this interview, I’ll send you a brief write up about what you shared and confirm that it is accurate. It would be great if you could give me feedback on whether those findings make sense and resonate with you and your experiences.
Our second interview will take place on Sunday, May 16th, at 10 AM. It’s a group interview where you and others will be asked to share your Education Journey Maps, if you feel comfortable, and talk about common themes or experiences. Are you able to attend?

I’d like to keep your identity anonymous, so you can enter the Zoom meeting using a fake name. Which fake name will you use?

Do you have any questions or concerns at this time?

Thank you! You are welcome to contact me at any time if you have any future questions or concerns or thoughts that come to mind.

Map your education journey from when you started school to now. Include interactions, conversations, people, places, obstacles, and opportunities on the way.

Consider:

- Draw your relationship with learning mathematics in school.
- What works for you and/or what doesn’t.
- What felt comfortable and/or what didn’t.
- What stood in your way and what helped you be successful?
You can use different colors to show different feelings, use symbols like lines and arrows or words.

These are just suggestions. Be as creative as you like and, if you don’t want to draw you can make more of a flowchart. Afterward, you will get a chance to explain it to me.
Hello everyone! Welcome to our first of 2 focus group interviews. I’m hoping that during this time you are able to benefit from hearing and commenting on others’ stories and perspectives on learning mathematics, and learning in school. The focus of this focus group will be on sharing our experiences learning in school, primarily high school.

Since we are meeting virtually, I’ll be sharing a Nearpod Link so that we can collaborate effectively. Here is the link: __________. Please join using your Pseudonym.

Before we begin, I want to remind of us some norms that can help ensure that we feel safe, comfortable, and have a positive experience today (shown on slide):

- There is no right or wrong answer. All ideas and stories are valuable.
- Show respect for differing ideas, thoughts, and values.
- Honor the time limit.
- Speak clearly into the mic.
- Speak from the heart and listen from the heart.

What are some other norms that you’d like to add for us today?
To start, I’d like to give you time to check out & comment on each other’s journey maps. You can add a post - it on each one and comment on:

- Themes: What are the similarities you see?
- Outlier: What stands out? What is different? Remember to be an outlier. It takes courage to say something. It may be something we are all thinking but many of us were too scared to say.

I’ll post these questions / prompts in the chat box so that you can reference it as you do the virtual gallery walk.

(give 10 minutes for folks to comment, play music..)

Okay now that you’ve had time to check out each other’s journey maps. . .Any immediate reactions? What stood out to you?

I’m going to ask us to think about our learning in high school mathematics. I’m going to do a sort of a guided recall to get you situated in that space. It might help to close your eyes or focus on a certain spot on the ground as I guide us.

I want you to think back to high school. Think of a memory, an experience that stands out for you when you think back on learning mathematics in high school. What was it like being in your math class and carrying the label of a student of color, of a student with a disability, of a student of color
with a disability. Were there experiences as you were learning that were comfortable or uncomfortable? Were there experiences of failure or success? What is it like walking through the door of the classroom, seeing your teacher, sitting at your desk, what was it like interacting with the teacher, the other students, the learning activity, did you work in groups? Did you work alone? What was that like? Did you listen to lectures from the teachers? Did you learn from a textbook? A handout? What did that feel like? Did you get accommodations in class? Outside of class? What was that like? What was it like taking a quiz or taking a test? Asking for help? Asking questions? Answering questions? Offering help to others? What was it like to receive help? Did you feel like you belonged? Did you feel like you were being ignored or watched? Rewarded or punished? Did you feel like you were a valuable part of the classroom? Did you learn? What were the challenges you faced? How did you overcome those challenges? Were there times when your identity came up? Were you aware of your identity?

As we come back to the group, I’m going to ask each of you to share out what came up for you. I want to remind you that there is no right or wrong experience. All experiences are important.

I’d like to give you 5 minutes each to so that we all have time to share. I’ll let you know if it’s been more than 5 minutes.

After each person shares out, I will invite the others to comment on:

- What do you love about what was shared?
- What questions do you have about what was shared?
- What does it make you think about your own life?
To close, I’d like to first thank you for sharing out. I know that this can be uncomfortable, especially sharing out to folks you’ve never met before, and this Zoom format might be impersonal. I truly appreciate your time. On the Nearpod, there is a space for you to write or record any final comments you have in regard to what was shared today. This is a space for you to share anything that you didn’t have time to share or didn’t feel comfortable sharing with the whole group.

Lastly, before we leave, I want to remind you all that we will hold our final focus group on Sunday May 30th. During that final focus group, we will focus on what we can learn from these experiences --- specifically, how can we use these experiences to benefit others? Just something to think about before we reconvene in a couple weeks. I hope you stay well in the meantime.
Appendix C

Interview #3 Group

Equity in Mathematics

“Cartographer’s Clinic” (Subini, 2019)

TIMELINE:

Third Interview (group) May 30th @ 10 am (PST) -- Meaning / What can we learn?

Make sure to record audio!

PROTOCOL:

Hello everyone! Welcome back to our final interview. . . . Last time we meant, we heard each other’s perspectives and experiences. Today we are going to unpack those experiences, exploring the meaning of those experiences and consider possible solutions. . .

I want to remind of us some norms that can help ensure that we feel safe, comfortable, and have a positive experience today (post in the chat)

- There is no right or wrong answer. All ideas and stories are valuable.
- Show respect for differing ideas, thoughts, and values.
- Honor the time limit.
- Speak clearly into the mic.
• Speak from the heart and listen from heart.
• Remember to be an outlier takes courage to say something. It may be something we are all thinking but many of us were too scared to say.

I’ve turned on the auto transcribing. I did the transcription last time, but I wasn’t able to catch everything. We’ll see how the auto transcription goes. It sometimes errs on the transcription. You should be able to turn it off on your end if you find it distracting.

What are some other norms that you’d like to add for us today?

To start, I posted some quotes on a Jamboard that stood out during the previous interviews. Similar to last week, I’d like if you can look through them, and comment on each:

• What do you notice?
• What does it mean to you?
  What is the significance, if any?
• What questions do you have? What does it have you question?

(give 10 minutes for folks to comment, play music..)

In the previous interview, several of you described. . .for example. . . what does that mean? Why does it matter?
1. Any immediate reactions? What stood out to you?

2. Several of you described descriptions of when you were *embarrassed to have the label of a learning disability or to receive accommodations*, or when peers would find out that you get extra time on a test or get to take the quiz in a separate learning space. Why? What does it matter?

3. Several of you described experiences of the *teacher or school denying accommodations and having to advocate for those accommodations*. What does the mean? Why does that matter?

4. Several of you described *experiences of feeling like the problem child* or problem student in the classroom, a burden for the teacher who does not know how to support you? What does this mean? Why does it matter?
   a. Did you feel like your teachers believed you were capable and could be successful in their class? Can you describe an experience that helped you realize that?

5. Relistening to the interviews, both the focus group from last week and the individual interviews, I did *not hear experiences where your abilities were valued in the classroom* . . . where your talents or abilities were praised.
   a. Is that accurate? For everyone here? If so, what do you think that means? Why does that matter? What is the significance?
   b. For those where it is not accurate, where or when did you feel you were valued? How so?

6. Several of your described experiences where the *math teacher only explained the problem solution in one only way*, (their) way. . . For example, expecting the homework or solution to be explained in the way it was taught, or having the same unhelpful
explanation repeated when you ask for clarification. What does this mean? Why does it matter?

7. We are going to do a few fill in the blanks, and for this one I’d like everyone to respond..(type in the chat box the phrase)
   a. Math teachers who want to support their students should. . .
   b. Math teachers who want to support their students should NOT. . .
   c. To do well in your math class, I advise that you. . .

8. Lastly, are there any questions that I didn’t ask that you wanted me to ask?

VISA Gift Cards will be sent out before June 30, 2021. If you do not receive it in your email or have any issues with it, please reach out to me.

I want to thank you all truly for taking the time to participate in this study. I know that we all lead busy lives and volunteering to spend more time on Zoom. . . It’s a lot. I want you to know that the work is important and that your sharing is so valuable. I know that I have changed for the better just by listening to your stories and your experiences. I hope that you all found value from this participation.

With that said, I am going to sign off. If you want to stay on Zoom and connect with each other, you are welcome to do so. It’s completely up to you, no pressure.

Please look out for an email from me in the next month or so. Goodbye!
EQUITY IN MATHEMATICS EDUCATION

Volunteers Needed

Help improve mathematics learning experiences for students

WE ARE LOOKING FOR INDIVIDUALS AGED 18-24 WHO IDENTIFY AS A PERSON OF COLOR AND HAD A LEARNING DISABILITY DURING GRADES 9-12.

You will be asked to describe your experiences learning in school. Participation involves four 90-minute interviews that will take place over Zoom.

If interested, please complete this form by April 9, 2021:

bit.ly/3O5math

Chapman University
IRB-21-145
Approved on 3-1-2021
EQUITY IN MATH LEARNING

VOLUNTEERS NEEDED FOR A RESEARCH STUDY

We are looking for recent high school graduates who identify as a person of color and had a learning disability during grades 9-12.

$100 VISA pre-paid card compensation

You will be asked to describe your experiences learning in school. Participation involves four 90-minute interviews that will take place over Zoom.

If interested, please complete this form by April 3, 2021:

bit.ly/3O5math