Learning Mathematics While Black in Rural Appalachia: Black Students' Counterstories and Freedom Dreams About Mathematics Education

Sean P. Freeland
sfreelan@mix.wvu.edu

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Learning Mathematics While Black in Rural Appalachia: Black Students’ Counterstories and Freedom Dreams About Mathematics Education

Sean P. Freeland

Dissertation submitted to the College of Education and Human Services at West Virginia University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Educational Theory and Practice

Matthew Campbell, Ph.D., Chair
Johnna Bolyard, Ph.D.
Sharon Hayes, Ph.D.
Tiffany Mitchell Patterson, Ph.D.

Department of Curriculum & Instruction/Literacy Studies

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ABSTRACT

Learning Mathematics While Black in Rural Appalachia: Black Students’ Counterstories and Freedom Dreams About Mathematics Education

Sean P. Freeland

This dissertation aims to illuminate and uncover the experiences of Black students’ learning mathematics in rural Appalachia and specifically West Virginia. The focal theory for this study is Critical Race Theory (CRT) which centers the experience of Black students and their voices. The intersection of race, mathematics education, and the context of rural Appalachia contribute to the analysis of these experiences in specific ways. Participants for this study included six Black high school students from various communities throughout West Virginia. Through interviews and mathematical autobiographies, these students shared their experiences learning mathematics across their schooling experiences and also considering their desires for an ideal mathematics education.

The dissertation is presented in the form of three manuscripts. The first manuscript explores these students’ mathematics identities and socialization in this context. I attend to the micro-, meso-, and macro-level influences in their mathematics learning with close attention paid to school and community factors as well as broader sociopolitical and cultural factors in rural Appalachia and the United States at-large. Students’ mathematics identities and socialization experiences are explored through counterstories which elevate their voices. The second manuscript draws on students’ freedom dreams about their ideal mathematics education as Black students in this context. Students consider what they would like mathematics education to be while also considering what they want their teachers to know about teaching Black students in this region. The final manuscript is an autoethnography detailing my own journey as a White male Appalachian and educator toward racial consciousness and to a study framed by CRT.

Findings highlight the endemic implicit and explicit racism that exists in Appalachian communities and schools and how this impacts students’ learning of mathematics. It also illuminates how Whiteness functions and morphs in different ways. This research raises issues about how mathematics education functions systemically and instructionally and how deeply ingrained certain de-humanizing features are in the field. It also explores how we can rethink mathematics education to be a more human and just experience for Black students in every context through freedom dreams. In all, this work explores the confluence of race and culture in rural Appalachia through the lens of CRT to center the racialized experiences of Black students in the region.
Dedication

To my children, Callum and Alden. I hope that you are as proud of me and my work as I am to be your dad.
Acknowledgements

I would first like to thank Dr. Matthew Campbell, my dissertation chair, for his guidance and support over my years in the program. Matt has been an important part of my educational journey from the time I was a classroom teacher, and his mentorship is invaluable to me. He has spent countless hours preparing me for this moment, and I cannot thank him enough. Matt has allowed me to pursue my own research interests while allowing me to feel like an equal in his amazing research projects. He has helped me to think about my work in different ways and has encouraged and supported me to share my research in various venues. I also appreciate the opportunity to do mentored teaching in his secondary mathematics methods courses, which has shaped my perspective as an educator. My experiences in this program have been nothing but positive, and he is to thank for that.

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future is in good hands with young people like these. The sharing of their stories will hopefully have an impact on the experiences of other Black students in rural Appalachia.

My former co-workers in the HSTA program have been an amazing support system throughout my time in the doctoral program. Dr. Cathy Morton, who also previously served on my committee, is a mentor and all-around amazing person. She always keeps me level-headed, has taught me so much about being a leader, and has helped me to learn about all that Appalachia is. Without her and her support, I would not be here. Merge McMillion and Summer Kuhn have been great friends and sounding boards for me throughout this journey, and I am very thankful for them. Also, Dr. Ann Chester played a major role in my development in this work.

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I am forever grateful for my parents, Larry and Denise Freeland, my sister, Megan Roskovensky, and my brother-in-law, Charlie Roskovensky, for always believing in me and pushing me to be the best I can be. They have set an example of being driven, caring, and loving educators and people that I have modeled myself after my entire life. Their love keeps me going.

I especially want to thank my wife, Kerri Swails Freeland, for her love and support throughout the program and my children, Callum and Alden, for inspiring me and giving me purpose. Kerri has read countless drafts, made suggestions that have made my work better, and
most of all she has loved me through it all. Her belief in me and my work got me started in this program and has helped me persist when it has been the toughest. This doctorate has taken place during some wild times, and she has been my rock throughout. For everything you do for me, I am incredibly grateful. Bringing our two children into this world through it all has been amazing, and I am thankful for my incredible family.

I am grateful for this journey. It has changed me in ways that I never knew was possible, and I believe it has made me a better person and educator. So many people have been a part of this, and I definitely cannot name them all. But thank you to everyone who has supported me and uplifted me over the past several years. Thank you.
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Introduction

renegades roam here
fugitive longing
darker than night
glorious black bodies
enslaved
with no hope of
belonging
to land
in this new world
of white freedom and flight
some live to die
sleep with no dreams
some find ways
to unravel mysteries
threads of power and domination
a palimpsest of greed
they hope
and hope
for change
find homeplace inside
letting anguish bleed out
make way for new life (hooks, 2012, p. 62)
Picture an American. A Southerner. An Appalachian. A West Virginian. Human nature forces us to conjure up images of each of these demonyms, mostly based on our experiences and media portrayals. Many of them, maybe all of them, most likely bring to mind a White person (or a White man). Such is the case of central Appalachia and West Virginia, a land that is predominantly White and assumed to be all White. But this assumption of Whiteness is damaging. bell hooks was a Black Appalachian from eastern Kentucky and often writes of her draw to the land of the mountains of her youth alongside her feelings of not fitting in there. In the poem above, she highlights many of the tensions that exist regarding race and culture in Appalachia. The connection that Black people feel to the region, but also the feeling of not belonging. The freedom that people feel here, but the strains that have been put on them by corporations and greed. The entanglement of race and class. The feeling of home, the pride, and the resentfulness of a place that at once is comforting and rage-inducing. It is a “strange land” with “peculiar people,” they say (Harney, 1873). But who are the people of rural Appalachia really? This dissertation aims to explore these tensions of race and place in mathematics education through Critical Race Theory (CRT).

**Researcher Positionality**

I enter this research from a position of privilege and my perspective as a White, cisgender, heterosexual male who is a lifelong Appalachian. I belong to these mountains, and I have felt as though they belong to me and people like me. I have felt the “white freedom” and the urge to flee that hooks speaks of; however, I have never felt the lack of belonging that so many Black people do when entrenched in the Whiteness of the region. Throughout my childhood, I was surrounded by people who look like me. My Catholic grade school was all White. My middle school was all White. My high school had less than ten Black students in a school of
1,300. In my time as a public school mathematics teacher, I worked in a school in which I had at most one or two Black students in each class. Race has been invisible to me most of my life. I considered myself a non-racist, and I did not partake in any explicit anti-Black racism. But I never thought about race. I never had to. So I never considered my complicity in a racist society and systems. I believed that everyone should be treated “equally,” in colorblindness and colorblind racism. Whiteness was the norm, my upbringing and early adult life was cloaked in it. Looking back, I never would have imagined that my work would be centered around race in this place I call home. I belonged, and I never felt like anyone would not.

I most recently worked for a statewide after-school program that specifically recruits Black students and its population is forty percent Black out of approximately 800 students. It also seeks out students who are from low incomes. Even entering this work, I did not see race as an issue in this region. I definitely saw the need for attention to class, but race remained in the background for me because it was allowed to be. This is what happens in Appalachia, class is centered while race is made invisible. At best, I considered myself being in a position to “save” Black students. My work in the after-school program coincided with the beginning of my doctoral studies, and being in that space while learning about theories related to race (along with reflection, experience, etc.) allowed me to see race in this place in a different way. I got to know these Black students, got to see their brilliance, and heard their stories especially in schools. This all led me to this line of research. I see what belongingness in Appalachia looks like for Black students when they work in community with each other. But this seems to be missing from the classroom, especially in mathematics classrooms. That is what drives this dissertation.
Race in Appalachia

Appalachia is a region that is commonly considered to span twelve states and stretches from central Mississippi to upstate New York. West Virginia is unique in that it is the only state viewed as entirely in Appalachia and is more specifically in the central part of the region (Appalachian Regional Commission, 2015). Appalachia is a geographical region, but it is also a cultural enclave that is presumed to be occupied by all-White, rural mountain folk who live off the land and are defined by their “peculiarity” and otherness. It is a place that is often defined by poverty and the working class, and there is an assumption that its people are in need of assistance and outside intervention (Catte, 2018). These are historical generalizations made about Appalachia and Appalachians, and they continue today. They are joined more recently by the claim that Appalachia is the heart of so-called “Trump Country.” Trump Country is characterized by stereotypes from national media and outsiders related to uneducated, ignorant people who often vote against their own interests, and who are particularly drawn to the supposed conservativism of Donald Trump and Republican lawmakers. These descriptions of Appalachians are usually made by those in power and outsiders to the region, and they ignore the nuance and diversity of lives in the region, including Black lives (Catte, 2018).

Appalachia is characterized by a “rural, normatively white population” (Anglin, 2002, p. 566). However, Black people and other minoritized groups make up a substantial proportion of the population in Appalachia and are an important (albeit mostly ignored) part of Appalachian history. Appalachia and West Virginia are well-known for a reliance on coal mining for economic purposes, and Black people have played a large role in the development of the coal industry. Black coal miners outnumbered White miners in multiple southern counties of West Virginia in the early twentieth century (Lewis, 1999). At that time, the coal industry in the region
was under the watch of large corporations and company towns. This ownership led to labor unrest as Appalachians’ bodies and lives were controlled by outside entities. In one of the most famous labor uprisings in American history, the Battle of Blair Mountain in Logan County, West Virginia, Black people made up approximately one-sixth of the people who fought for the rights of coal miners and their communities (Catte, 2018).

The power and influence of Black lives in West Virginia and Appalachia has been all but erased from history and forgotten by most, but the region today is much more diverse than assumed. Little scholarly work has attended to Black lives in central Appalachia, and racial issues are often disregarded in the region (Blee & Billings, 2001). Because of the normativity of Whiteness and the monolithic representation of Appalachians as impoverished, class and economic issues are at the forefront of the narrative about Appalachia. A focus solely on the economy has made race invisible in many ways and ignores the thriving Black communities in which many Black Appalachians live (Hayden, 2002). This emphasis on “white problems” has created a situation in which racial issues in Appalachia are ignored (Cabell, 1985, p. 3). In fact, some see White economic concerns as being overshadowed by fights for LGBTQ+ and racial justice (Catte, 2018). This seems to be forgiven as Appalachians prescribe to a racial innocence because of the economic disparities they experience (Smith, 2004). This may be especially true in West Virginia as it is the only state to be formed during the Civil War, seceding from the Confederate state of Virginia to join the Union because the region was anti-slavery. West Virginians often cling to this narrative to dismiss racism in the state.

**Critical Race Theory**

The theoretical framework for this dissertation is Critical Race Theory (CRT). CRT, borne out of critical legal studies and radical feminism, is a movement that consists of thinkers,
scholars, lawyers, educators, and activists. The main principle in CRT is that racism is endemic in American society, even after the civil rights movement (Delgado & Stefancic, 2012). This contradicts the idea that we live in a “post-racial” society where racism no longer exists. Racism exists, and it is power-laden and is embedded in the institutions and structures of our nation rather than simply a micro-level, interpersonal issue (Crenshaw, 2011). Critical race theorists believe that racism is the “everyday experience of most people of color in this country” (Delgado & Stefancic, 2012, p.7), and there are other principles that define the theory. Interest convergence, the idea that any advances for Black people in America occur because it also benefits White people, is a main tenet of CRT (Bell, 1980). CRT also brings to the forefront the fact that race is a social construction rather than a biological difference. The concepts of intersectionality and anti-essentialism ensure that there is not a monolithic view of race in CRT. Critical race theorists acknowledge that Black people are simultaneously constructing gender, sexual, religious, and other identities and that there is no one way to define all people of color (Delgado & Stefancic, 2012).

From the beginning, CRT has been intertwined with education through the work of Derek Bell and other founders of the movement surrounding the Brown v. Board of Education legal decision. The Brown case, viewed as a landmark ruling in the civil rights movement, had unintended consequences and highlights the concept of interest convergence. This laid the groundwork for CRT. The Brown decision outlawed the principle of “separate but equal,” but this was done in order to make those in power (White men) seem benevolent and to improve the international perception of America (Bell, 1980). Following the desegregation of schools, Brown forced the removal of Black teachers and administrators from influential positions and closed Black schools that were positive forces in their communities and in the lives of Black people.
Bell (1976) discusses this by showing that civil rights lawyers fought for the *Brown* decision while at times neglecting the desires of their clients who wanted their educational experiences to remain intact. These outcomes of the *Brown* ruling demonstrated the need for a legal theory which centered race and moved beyond civil rights, hence CRT.

In the late twentieth century, CRT in education was formalized via the work of Gloria Ladson-Billings and William Tate (Ladson-Billings, 1998; Ladson-Billings & Tate, 1995; Tate, 1997). Ladson-Billings and Tate (1995) created a framework for applying CRT to education. In their creation of a CRT for education, they outline three main principles to guide the work. Mirroring and following CRT in legal studies, they state that racism is ever-present in society and that inequities in education arise because of this (Ladson-Billings & Tate, 1995). Secondly, answering the call for CRT to move beyond interpersonal race relations, Ladson-Billings and Tate bring to the fore the idea that American society functions around property rights which is especially important as Whiteness is a form of property in society and education (Harris, 1993). Lastly, the framing of CRT is found in the intersection of race and property and this combination helps us to understand society and schools (Ladson-Billings & Tate, 1995).

**Race and CRT in Mathematics Education**

The dominant discussion regarding race in mathematics education centers on traditional notions of student success and the so-called “achievement gap,” which highlights disparities in standardized test scores between Black and White students (see Lubienski, 2008). Policymakers and educators point to this “gap” as a reason to pathologize Black students, their families, and their communities. A focus on the achievement gap has led to decision makers taking part in “gap-gazing” (Gutiérrez, 2008) where they look at the lack of achievement of Black students compared to White students and view the students themselves as problems that need to be fixed.
This does little to address the roots of these issues that are embedded in educational systems and other governmental institutions.

This gap is easy for researchers and educators to highlight because of the presumed objectivity in mathematics. Recently, there has been a contentious discussion in mathematics education circles about the neutrality of the subject. Proponents of the objectivity of mathematics argue that 2+2=4, and that this is true no matter what. However, others argue that this, along with other algorithms that are pervasive in our lives, is a contextual fact using a certain number system that has been normalized in Western schools and society. This objectivity has invaded all levels of mathematics, and this can have dire consequences for minoritized populations (O’Neil, 2016). An argument for the neutrality of a field constructed by humans implies that there is only one way of knowing mathematics and can be seen as a defense of White supremacy in mathematics education (Rubel, 2017). This objectivity can be traced throughout the history of the field, including through the standardization of mathematics education by the National Council of Teachers of Mathematics (NCTM) (1989, 2000) and other organizations. Using a CRT lens, these national agendas can be seen as “race remediation” (Bullock, 2019) in which educational reforms are presented as providing equity to Black children, but they actually reify disparities. The focus on objectivity in mathematics education is also fostered by the notion of a post-racial society. While this idea is being challenged in the present day by powerful protests and activists fighting against police violence against Black people, racism is still the norm. And this is especially so in areas that are predominantly White.

To push against this objectivity, researchers have moved towards examining the racialized way in which Black students learn mathematics (Martin, 2012). One way this has been done is with a CRT lens by illustrating the successes of Black students in learning
mathematics despite being held to low expectations and their assets being undervalued in mathematics classrooms (Berry, 2008; Berry et al., 2011; McGee & Martin, 2011; Stinson, 2008; Stinson et al., 2013). There is also work being done to research the mathematics identity development and mathematics socialization of Black students. A large body of work is related to successful Black males and their positive mathematics identities (Berry et al., 2011; Jett, 2011, 2019; Noble, 2011). There is also an emerging field of feminist work in mathematics identities of Black girls and women (Gholson & Martin, 2014; Johnson, 2009; Leonard et al., 2020).

**Study Overview**

In rural Appalachia, Blacks are invisibilized as a “minority within a minority” as class dominates the conversation forcing racial issues to the background (Gaventa, 1980). Thus, it is of little surprise that Black students in West Virginia and rural Appalachia have largely been ignored in mathematics education research. Most of the research addressing race has occurred in urban contexts and in hyper-segregated schools with a high majority of Black students. There is a dearth of research on race in education in rural areas and Appalachia in particular, and it is especially missing from mathematics education research. This dissertation aims to address this research gap.

I do this through three manuscripts that center race in rural Appalachian mathematics classrooms. The first piece explores Black students’ mathematics identities and socialization as students in rural Appalachia. Through mathematics autobiographies and interviews, Black students will provide counterstories to the dominant narrative of mathematics education in the region. In the second piece, I seek to challenge current discourses in mathematics education regarding equity and social justice along with students who freedom dream about their ideal mathematics education as Black students in the rural Appalachian context. As I conduct this
research, I aim to chronicle my journey to CRT work and to observe and reflect on my work as a researcher and educator. This will be documented through my third manuscript, an autoethnography about my “Coming Into CRT.” In total, this work aims to document the current state of race in mathematics education in a specific sociocultural, historical, and political context and to seek a way forward as we rethink what mathematics education can and should be.
Learning Mathematics While Black in Rural Appalachia: Black Students’ Counterstories of Mathematics Identity and Socialization

Traditionally, mathematics education research has been focused on teaching and learning, cognition, and individuals and their approaches to mathematics (i.e., Carpenter et al., 1989; Erlwanger, 1973; Steffe & Kieren, 1994; Vergnaud, 1988). This approach has failed to attend to the social aspects of schooling and learning mathematics; however, more recent work has acknowledged that learning mathematics is a social experience and has moved away from a focus on individuals’ thought processes (Lerman, 2000). Moving beyond this perspective, there is now a sociopolitical turn (Gutiérrez, 2013) in mathematics education research that focuses on issues of identity and power in the field. This is an important shift because it recognizes that mathematics education, and education at large, is an inherently political field (Ayers & Ayers, 2014). This pushes back against the “absolutist view” of mathematics education that creates a racial hierarchy of mathematics ability based on personal features such as race, family background, socioeconomic status, and other factors that are situated outside of classrooms (Martin, 2009).

A shift towards a political view of mathematics education is necessary considering that mathematics is a privileged field in schools and can serve as a gatekeeper to higher levels of the education system (Moses & Cobb, 2002; Stinson 2004). This may be attributed to the entanglement between mathematics and the market economy in the United States and capitalism. Thus, mathematics education is seen as serving neoliberal and neoconservative views that value a free market with an emphasis in STEM fields (Martin, 2013). In fact, STEM education can be viewed as a form of capital (Bullock, 2017). The fact that mathematics education is an economic force in the United States causes race and racial issues in mathematics classrooms to be pushed to the background. In this way, mathematics education is also a racial project (Martin, 2013) that
expects Black students to “act White” or assimilate to dominant views of success in mathematics to achieve highly or risk being left behind. This causes a colorblind rhetoric focused on the generic “all students” to avoid addressing race and racism.

This backgrounding of race has led researchers to bring race and students of color to the forefront in their mathematics education research. Martin (2009) calls for work that moves the field from traditional foci of research to an emphasis on the racialized way in which students learn mathematics. It is necessary to examine the ways that Black students and other students of color view their mathematics abilities and develop identities as mathematics learners. While a colorblind lens is popular among some educators, it is essential to recognize that race affects the way that students experience the world and mathematics education (Chapman, 2013). The ways in which Black students are socialized into mathematics is also highly contextual. Because of this, it is necessary to explore the peculiarities and complexities of the experiences of Black learners of mathematics in various spaces and geographies while also attending to the intricacies of individual and schoolwide interactions (Martin, 2009).

Martin (2000, 2006, 2009, 2012) has presented multiple frameworks for studying the racialized nature of learning mathematics. These frameworks attend to mathematics identity and socialization. In “Learning Mathematics While Black,” Martin (2012) asks, “What does it mean to be a learner…of mathematics in the context of being Black and…what does it mean to be Black in the context of learning…mathematics?” (p. 59). These two questions guide this study which is situated in a context that is rarely studied in education at-large and in mathematics education specifically. Much extant research focuses on Black mathematics learners in hyper-segregated schools or in urban areas. I use Martin’s (2000) framework for analysis (see Figure 1) of mathematics identities and socialization situated in an understudied, contextualized locale. In
In this work, I seek to document the realities of learning mathematics while Black in mostly White, rural Appalachia—a context where issues of races are often invisible—by centering Black students’ voices and stories through counterstories.

I enter this research from my perspective as a White, cisgender, heterosexual male who is a lifelong Appalachian. In my time as a public school mathematics teacher, I worked in a school in which I had at most one or two Black students in each class. I most recently worked for a statewide mathematics and science after-school program that specifically supports Black students from across the state of West Virginia. Working for this program has made race visible to me in a way that my upbringing and classroom teaching did not. It has led me to wonder what the experiences of Black students are in mathematics classrooms in this particular context and in this particular political and sociocultural climate. All of this has led me to seek to explore the following research questions:

1. How do Black students construct racialized mathematics identities in rural Appalachia? What contributes to this construction?

2. How are Black students socialized into mathematics in rural Appalachia? How does this influence their experiences as learners and doers of mathematics?

In order to address these questions, I draw on the constructs of mathematics identity and socialization through the lens of Critical Race Theory (CRT). In the following section, I outline the theoretical framework for this study, focusing on Martin’s (2000) tiered framework for examining context, the constructs of mathematics identity and socialization, as well as CRT in mathematics education and rural Appalachia.
Theoretical Framework

In today’s society, mathematics education is a form of property (Bullock, 2017), which makes it a valued and privileged field. Thus, it is essential to study the racialized experiences of Black students learning mathematics. By situating this study in rural Appalachia, I answer Martin’s (2012) and Ladson-Billings’ (2005) call to situate mathematics education research focused on race in a sociohistorical context. Economic issues for working class people in the region are pervasive and dominate the discourse, and this must not be at the expense of issues of race. Appalachia needs research attending to race, and it is especially important in mathematics education. Through the lens of CRT, this work aims to explore the intersection of race, property, and mathematics education through counterstories of Black students to examine their mathematics identities and socialization in rural Appalachia.

To do this, I draw on Martin’s (2000) framework for research on mathematics identities and socialization. This tiered framework acknowledges that mathematics learning is affected by the sociopolitical and historical context, the communities and schools in which students live and learn, and students’ individual agency and efficacy. This examination of micro-, meso-, and macro-levels (Martin, 2013, see Figure 1) of mathematics learning while Black is especially important in rural Appalachia, as many aspects of Black lives in the region have been left unexamined. I approach these research questions through the lens of CRT which allows for these invisible mathematical experiences to be made visible through Black students’ counterstories while also exploring how Whiteness and race functions in rural Appalachia. Using this framework, I next outline the current conceptions of and research on mathematics identity and socialization while outlining how these function inside the meso- and macro-levels in rural Appalachia through the lens of CRT.
Mathematics Identity

In the twenty-first century, following the shifts in mathematics education research that acknowledge that mathematics learning is a social and political endeavor (Gutiérrez, 2013; Lerman, 2000) and Martin’s (2000, 2006, 2009, 2013) various calls to action, there is a strong body of work focusing on racialized mathematics identities. Mathematics identity refers to the “dispositions and deeply held beliefs that individuals develop about their ability to participate and perform effectively in mathematical contexts to use mathematics to change the conditions of their lives” (Martin, 2012, p. 19). In her definition of equity, Gutiérrez (2012) uses a mirror/window metaphor to describe mathematics identities. It is the way that students see themselves in the mathematics curriculum, how they see the world through mathematics, and how students make meaning of mathematics in their lives. Identity also deals with how students are able to use their cultural, familial, and linguistic resources to do mathematics (Gutiérrez, 2012). Students develop mathematics, racial, gender, and other identities simultaneously and
through their interactions with others and the institutions, including mathematics education, in which they live and learn (Martin et al., 2017).

While there are multiple conceptions of mathematics identities (e.g., Cobb et al., 2013), I draw on Martin’s (2000) definition that mathematics identity is students’ beliefs about multiple aspects of mathematics learning: their ability to perform, the importance of mathematics, roadblocks and opportunities to learn, and motives and methods for learning. This definition attends to the ability for students to define “what it means to be African-American in the context of mathematics learning” (Martin, 2000, p. 20). I also use the notion of identity from Sfard and Prusak (2005) that equates identity with personal narratives. This is especially important as identities are revealed through counterstories in this study. Identities are fluid and ever changing and are “collections of stories about persons” (Sfard & Prusak, 2005, p. 16).

The following studies attend to various aspects of Martin’s (2000) definition of mathematics identity. They also show the way in which racial and mathematics identities develop simultaneously and how they are affected by factors from the micro- to the macro-level of their lives and mathematics learning. In these studies, Black students from all levels of the education system have their stories told, exhibiting the narrative nature of identity development (Sfard & Prusak, 2005). I aim to draw on these studies while providing space for Black students in rural Appalachia to share their stories of identity development through counterstories.

There is an abundant body of extant research examining the construction of racial and mathematics identities through stories of successful Black males (Berry, 2008; Berry et al., 2011; Jett, 2011, 2019; Noble, 2011). These studies cite a dearth of research on mathematics achievement in Black males and an essentialization of them as lacking persistence and a drive to succeed. Berry’s (2008) participants were Black males in middle school who were successful in
mathematics. Along with other factors, he found that these students developed positive mathematics and academic identities which aided in their success. In a study of Black males in postsecondary school, Noble (2011) honed in on the students’ self-efficacy. Positive self-efficacy led to the construction of positive mathematics identities which guided them to accomplishments beyond high school. Berry and colleagues (2011) highlighted reasons for the development of positive mathematics identities in Black males. They focused on middle school students who were in a predominantly White, rural space. The researchers found that learning with fellow successful Black students in a summer program, positive recognition, and a connection with the mathematics contributed to mathematics identity development and success.

In his studies of Black male mathematics identity development, Jett (2011, 2019) examined various aspects of being a successful mathematics student. Jett’s (2011) case study of a Black male doctoral student in mathematics traces the students’ identity as he navigated the academy from K-12 mathematics education towards a terminal degree. At various points in his journey, the student viewed himself separately as a competent doer of mathematics and as a poor mathematics student. Jett (2011) emphasizes the parts of the student’s journey to mathematics that helped him to identify with mathematics, namely a Black professor who mentored him and allowed him to see another successful Black male in the field. Jett (2019) also tells the stories of two Black male students in college who were denied the title of valedictorian at their respective high schools. In both studies, the researcher highlights the racist policies, institutional racism, and individual racism that hinder Black males from developing positive academic and mathematics identities while also highlighting their resilience.

A smaller, but growing, field of research uses feminist theory as a frame for studying Black girls and their mathematics identities (Gholson & Martin, 2014; Johnson, 2009; Leonard et
The Black feminist viewpoint allows researchers to examine the unique perspective of Black girls in the White male dominated field of mathematics. Johnson (2009) found that middle school Black girls developed their mathematics identities based on their teachers in the class they were taking at the time, but they had trouble connecting their personal lives to the mathematics. In a study of Black girls in third grade, Gholson and Martin (2014) tie the social networks of Black girls with the creation of their mathematics identities and other identities in the classroom culture. Exploring the historical nature of Black female mathematics learners, Leonard and colleagues’ (2020) participants are from five generations of the same family. The researchers show that sociohistorical and political contexts are major factors in the development of Black females’ mathematics identities and that familial relations can support resilience and perseverance.

Some studies on mathematics identities allow for Black males and females to “share theoretical spaces” (Gholson, 2016, p. 297). Nzuki (2010) explored Black students’ mathematics and technology identities using the concept of the “figured world” of the mathematics classroom. He found that identities were formed by how the students navigated their figured world, and this led them to become achievers or non-achievers in mathematics. The participants in Walker’s (2012) study were Black mathematicians whose experiences showed that mathematics occurs in and out of school contexts. These mathematical experiences complement each other and affect the development of positive and negative mathematics identities. Thompson and Davis (2013) use an African-centered worldview to frame their study in order to contrast Black lives from the Eurocentric culture that is present in the United States and in mathematics education. The researchers discuss the unique factors of Black lives that contribute to students’ mathematics identities including a communal way of life (Thompson & Davis, 2013).
McGee and Martin (2011) and Larnell (2016) studied mathematics identities at the postsecondary level. With a focus on high-achieving Black mathematics and engineering students, McGee and Martin (2011) explored identity development as students dealt with managing stereotypes and working to legitimize themselves as STEM students. Larnell (2016) conducted his study with Black students in non-credit bearing remedial mathematics classes. The research focused on the transitions of students from being academically (and mathematically) successful to being “satisficers” who performed just well enough to get by. This was due to threats to their perceptions of their ability to succeed in mathematics from various institutional and interpersonal sources (Larnell, 2016).

**Mathematics Socialization**

Martin (2000) defines mathematics socialization as the “processes and experiences by which individual and collective mathematics identities are shaped in sociohistorical, community, school, and intrapersonal contexts” (p. 19). I use Martin’s (2000) definition of mathematics socialization and this work to explore the *experiences* of Black students learning mathematics. I also attend to the idea that mathematics socialization does not only occur in schools, but also is affected by families, communities, and broader cultural contexts. Because of the entanglement of identity and socialization, many of the studies focused on mathematics socialization also address identity issues (Jackson, 2009; Stinson, 2006, 2008, 2011, 2013; Walker, 2016). Walker (2016) highlights the importance of community in and out of school in the mathematics socialization of Black students, particularly in urban areas. This includes familial and neighborhood relationships and all stakeholders (administration, teachers, staff, students) in schools. Reinforcing this assertion, Jackson (2009) explored socialization and identity development in a middle school mathematics classroom nested in a specific school culture. The school in the study portrayed a
deficit view of its Black students and felt that students needed to be “changed.” This perspective and the classroom activities presented led students to be socialized into believing that mathematics only consists of following procedures quickly and accurately. The socialization that occurred in the school and specific classroom limited the possible mathematics identities, both positive and negative, of the students (Jackson, 2009).

Stinson has a prolific body of work relating to mathematics socialization and identity, much of which is centered on how Black males must navigate existing sociocultural discourses. In his early work, he calls for a shift in the framing of Black male mathematics students from one of deficiency and rejection to one of achievement (Stinson, 2006). Answering his own and others’ call to highlight successful Black males, Stinson (2008, 2011) uses counterstories to illustrate how these students dealt with issues such as stereotype threat, the culturally created image of the Black male, the perceived necessity to act White to be successful in mathematics, and the pressures to assume a raceless persona. These sociocultural concepts impact how Black males are socialized into mathematics and in turn the identities they develop. The students in Stinson’s studies variously applied to, redefined, and resisted the various discourses they faced in order to create “robust mathematics identities” for themselves which allowed them to navigate mathematics education effectively (Stinson, 2013, p. 87).

The salient research in the field of mathematics identity and socialization provides mathematics educators and policymakers with perspectives that challenge the notion of an achievement gap and a racial hierarchy of mathematics abilities; however, most of the work is conducted in schools and communities that are largely urban, densely populated, and mostly Black. Berry and colleagues (2011) situated their study in a rural, predominantly White space; however, they did not foreground the cultural and sociohistorical context. While drawing on
similar frames for mathematics identity and socialization as me, these studies highlight a gap that exists in which there is little work in rural areas that are sparsely populated, isolated, and presumed to be all White. Much like the studies presented here have illuminated the experiences of Black students who have been historically presented as deficient, this study will bring to light the experiences of Black students learning mathematics in Appalachia. Through their counterstories, I aim to bring to the fore the specific cultural and historical context that is rural central Appalachia (West Virginia) and illustrate what it means to live and learn mathematics while Black in the region.

**Critical Race Theory (in Mathematics Education)**

CRT is an influential framework used to study students and teachers in K-12 schools, pedagogy and curriculum (e.g., critical race pedagogy), educational law and policy, and higher education (Ledesma & Calderon, 2015). Some of the principles that drive CRT have allowed researchers to center educational issues on race and to highlight the way that racial inequities manifest and function in American schools. These include an acknowledgement that racism is structural and is embedded in all aspects of society, a resistance to neutrality on issues of race, and a focus on counterstories from individuals and a valuing of their experiential knowledge (Ladson-Billings & Tate, 1995). Other tenets include a focus on social justice, an attention to intersectionality, and a challenging of dominant perspectives (Kohli, 2009). Researchers have used these principles in various ways when studying teachers and students in American schools.

There is an emerging body of research in mathematics education that uses CRT as a framework (Critical Race Theory in Mathematics Education or CRT(ME)) with a focus on the voices and brilliance of Black students (Jett, 2012). As CRT(ME) work intersects research on mathematics identities and socialization, many of these studies have been highlighted above
LEARNING MATH WHILE BLACK IN APPALACHIA

(Berry, 2008; McGee & Martin, 2011; Stinson, 2008). These works address various aspects of CRT(ME) including the ability to use CRT to span across disciplinary boundaries (Berry, 2008); the value of experiential knowledge and counterstories (Berry, 2008; McGee & Martin, 2011; Stinson, 2008); the acknowledgement and examination of the interplay between everyday, colorblind racism and structural racism (McGee & Martin, 2011); and the ability to combine CRT with other theoretical frameworks (Stinson, 2008). Other studies illustrate similar ways to use CRT as a framework in mathematics education, including Jett’s (2016) case study of a Black male mathematics major at an Ivy League school and Terry and McGee’s (2012) study of how Black males are supported in their learning of mathematics. These studies also show how CRT(ME) must have a focus on justice and action (Terry & McGee, 2012).

This study draws on the work of various CRT scholars and theorists and builds on their work to situate it within a context (rural Appalachia) in which race is rarely examined, especially in mathematics education. The tenets of CRT that drive this study include:

1. Racism is normal in American society and schools (Delgado & Stefancic, 2012)
2. Interest convergence functions differently in rural Appalachia (Bell, 1980; Delgado & Stefancic, 2012)
3. American society (and schools) is based on property ownership and rights and Whiteness is a form of property (Harris, 1993; Ladson-Billings & Tate, 1995)
4. Experiential knowledge of Black students and counterstories are rich sources of knowledge (Delgado & Stefancic, 2012; Ladson-Billings & Tate, 1995)

I also want to move beyond the teaching and learning lens that is so common in mathematics education to focus on “the impact of racism as a structural phenomenon through racial taxes and associated discursive frames that support these racial costs for students of color” (Rousseau
Anderson, 2019, p. 27). Next, I discuss the current and historical racial issues in rural Appalachian and West Virginian society and schools through a CRT lens. I also discuss how a CRT(ME) framework for this study can disrupt many of the dominant discourses surrounding race in Appalachia

**Race in Appalachia**

CRT is an essential framework for educational research, and many of the tenets of CRT are relevant to Appalachian history and its present situation. For one, racism is endemic in Appalachian history and its society today. Drake (2001) describes a brutal slave auction that took place in Lewisburg, West Virginia, highlighting the deep roots of racism that still are present today. Recently, there was a movement to remove a Confederate monument in the same town, but officials refused to do so. This has led to a bill that has banned the relocation or removal of Confederate statues and monuments across the state (McElhinny, 2021). Racism has persisted as White supremacy has adapted throughout West Virginia’s history and continues today. In the past few years, many racist events have occurred through the government, education system, and other institutions upon which the state is built. On a day to celebrate Republicans at the State Capitol, a display conflating Muslims with terrorists was a centerpiece (Linton, 2019). Corrections officers in training were photographed giving a Nazi salute (Bellware, 2019). A Black student was suspended from his basketball team for wearing dreadlocks (Saunders, 2020), which gave way to the introduction of the “Crown Act” protecting Black people from discrimination based on their hair. The bill has failed (Davis, 2022). The governor of the state called Black coaches and girls basketball players “thugs” and admitted that Barack Obama would not be welcome in West Virginia while he is in office (Bogage, 2020; McElhinny, 2020a). Meanwhile, Donald Trump has easily won the electoral votes from West Virginia in the past two
elections (McElhinny, 2020b), showing some West Virginians’ acceptance of racist ideals. Most recently, there was a bill raised in the state legislature to ban the teaching of CRT and calling for “curriculum transparency” in state schools (Adams, 2022). Racism is alive and well in West Virginia, and CRT is necessary to center the voices and experiences of Black people.

As White people in Appalachia often consider themselves an oppressed population (Catte, 2017), CRT can bring to light racial issues that have been cloaked by economic issues. As Ladson-Billings and Tate (1995) state, American society is based on property rights. Property is a complicated issue in Appalachia and West Virginia, as the people and the land have been exploited by outside corporations who pay few taxes but use up resources (Catte, 2018). Historically, the only way to wealth in Appalachia was through the ownership of land, and Black people were often unable to purchase property (Blee & Billings, 2001). But these economic issues fail to address the fact that Whiteness in and of itself is a form of property (Harris, 1993), and for many Appalachians it is the most powerful currency they have. Economic exploitation has allowed this to be ignored causing racism to survive and thrive. Drawing on the interest convergence principle (Bell, 1980) of CRT, there has been little opportunity for White people in West Virginia to benefit from Black people’s gains, thus there has been little attention paid to racism.

Methodology/Methods

Critical Race Methodology

Aligning with the CRT theoretical framing of this study, I use a critical race methodology incorporating aspects of narrative inquiry. CRT can provide a “methodological instrument for collecting and understanding the perspectives of marginalized groups” (Morris & Parker, 2019,
Critical race methodology is a way to enact research that centers race and has the following principles from Solórzano and Yosso (2002). Critical race methodology:

1. Examines and disrupts the way race, gender, and class affect schooling experiences of Black students
2. Moves beyond traditional, objective forms of research
3. Emphasizes action in the face of racial subordination
4. Focuses on racialized experiences of Black students
5. Uses interdisciplinary knowledge

**Narrative Inquiry and Critical Race Counterstories**

Narrative inquiry is the study of human lived experiences in the form of stories (Clandinin, 2013). In this study, these stories are critical race counterstories which are a centerpiece of CRT and critical race methodology. Narratives are embedded in interactions and societal structures, and they relate to power, status, and identity (Atkinson & Delamont, 2006). Critical race counterstories are narratives that challenge and disrupt dominant discourses, perceptions, and assumptions (Romeo & Stewart, 1999). I use narrative inquiry and counterstories to explore students’ identities and socialization and how their stories can disrupt the dominant discourse in rural Appalachia. In these counterstories, I draw on Clandinin and Connelly’s (2000) idea of a three-dimensional narrative inquiry space. These dimensions include temporality, which implies that narratives and experiences have continuity across time. The participants in this study tell stories that span their lives and schooling experiences. The personal and social parts of narratives are another dimension which relates to the students’ individual experiences in school and community settings. The third aspect is place which ensures that narratives are located in a specific context, in this case rural Appalachia. The social nature of
narratives makes them able to be critical and to address power issues. They can be used to study inequities and racial oppression in historical and cultural contexts (Sparkes & Smith, 2008).

This approach to research uses stories from minoritized populations to understand how they experience mathematics education. It allows for voices that often go unheard to be elevated to highlight often ignored realities in life and education (DeCuir & Dixson, 2004). Critical race counterstories do not only provide a different perspective, but they “expose and challenge White rationality” and White dominance that pervade Appalachia and mathematics education (Bullock, 2019, p. 78). These stories upend dominant narratives of deficiency and need for remediation and “contextualizes student-of-color experiences in the past, present, and future” (Solórzano & Yosso, 2002). These counterstories do not only focus on positive mathematics identities and experiences for students. Rather, they highlight the complexity of being a Black mathematics student in this specific context. A critical race methodology challenges normative values and principles that allow racism to persist (Matsuda et al., 1993). A combination of critical race methodology and narrative inquiry is necessary in this study because “in CRT, narrative is counterstorytelling” (Berry & Cook, 2019, p. 88).

Participants and Data Collection

Participants for this study were students who self-identify as Black and at the time were high school students in West Virginia enrolled in an after-school science and mathematics program. This program is unique to West Virginia and specifically aims to recruit Black students and other minoritized populations. The goals of the program are enriching students in mathematics and science while also educating them in community-based research. This is done with the aim to prepare them for post-secondary education. Students in the program are required to maintain certain traditional academic standards, including maintaining a high grade point.
average, along with other requirements as part of the program curriculum. Thus, these students have all experienced certain levels of traditional academic success. I worked for the after-school program for multiple years, and through this work I mentored these students in their research and club activities in various communities across the state. I have close relationships with the participants in this study, and I have spoken at length with them about their schooling experiences. My relationships and conversations with these students motivated this research as I wanted to elevate their voices and stories. While conducting the research, I remained mindful of power relations at play during interviews and other communication. I am a privileged White male who spoke to the students about race while also occupying a position of authority to them in the program. These relational aspects were considered and remained salient throughout the research while I continuously assessed my own positionality, the positions of the students, and my own biases. I used convenience and purposive sampling (Auerbach & Silverstein, 2006) to recruit students with whom I have a mentoring relationship. They were contacted personally by me and through field staff of the after-school program in various regions throughout the state. Data collection continued until it reached a theoretical saturation point (Auerbach & Silverstein, 2006) which occurred when I was able to recruit multiple students from various communities throughout West Virginia representing differences in regional, community, and school contexts. These students’ high school experiences have been unique as their schooling has been disrupted yearly beginning with the West Virginia teachers’ strikes which started in 2018 and ending with the changes in learning environments due to the COVID-19 pandemic.

Participants were first asked to write mathematics autobiographies (Stinson, 2013) which gave them a chance to reflect on their experiences learning mathematics throughout their schooling. The content of these autobiographies was used to guide questions during semi-
structured interviews that followed. Initial interviews were conducted in focus groups or individually. Follow-up individual interviews occurred one to two weeks after the initial interviews. Both sets of interviews were designed to zoom in on individuals and their mathematics identities and socialization and to zoom out on their experiences situated in this specific sociohistorical context (Stinson, 2013). Interviews lasted sixty to ninety minutes, and they were modeled after Seidman’s (2013) three interview series outlining students’ life histories regarding mathematics learning, their current experiences in mathematics, and their reflections on the meaning of all of these experiences. They were also designed to elicit critical events (Webster & Mertova, 2007) (see Phase 2 of data analysis below). I continued to communicate with students by e-mail and in person to clarify information or to gain more insight into certain responses which was added to the already collected data.

Data Analysis

The data from the mathematics autobiographies and interviews was transcribed and analyzed using narrative analysis to construct critical race counterstories. Narrative analysis differs from analysis of narratives in that the former involves a construction of individualized stories from data while the latter searches for themes from research participants’ stories (Martinie et al., 2016). Specifically, I draw on critical narrative analysis in order to explore how macro- and micro-levels interact and affect each other in each student’s story (Souto-Manning, 2014). As the interviews and autobiography data were conversational and fragmented, narrative analysis was used to “synthesize…data and (re)construct them into a coherent story rather than separating them into different categories” (Martinie et al., 2016, p. 660). I used narrative analysis in order to preserve the voices of the students and to “reveal the subjective experience of participants as they interpret the events and conditions of their everyday lives” (Coulter & Smith,
Using narrative analysis allowed for the uniqueness and complexity of students’ experiences in different Appalachia communities to be illuminated. The process I used, drawing on Erickson’s (1986) work, was recursive and involved initial analysis and multiple revisits to data. It first involved reading through the data and constructing possible stories, then revisiting the data and looking for confirmation or disconfirmation of my ideas, and finally adjusting and reconstructing narratives as I continued to re-analyze data (Coulter & Smith, 2009). The narrative analysis consisted of the following five phases. This all occurred with a CRT lens, centering students’ racialized way of learning mathematics.

**Phase 1: Autobiography Coding** My initial data analysis involved coding the mathematics autobiographies with my working definitions of mathematics identity and socialization from Martin (2000). Regarding identity, I coded instances of students’ perceptions of their mathematics ability, the importance of mathematics to them, the opportunities and hindrances they find in mathematics learning, and their motivations and processes for learning mathematics. In terms of mathematics socialization, I coded for processes and experiences related to the above aspects of identity. I also coded data according to context, highlighting instances of macro- and meso-level influence. These codes were used in narrative construction, and they also guided interview questions in focus groups and with each individual. This allowed me to probe at specific aspects of and events in the students’ mathematics identity development and socialization.

**Phase 2: Autobiography and Interview Coding/Critical Events** Following the initial interviews, I transcribed and coded the data in the same way as in Phase 1. I maintained the codes relating to mathematics identity and socialization, refining them in order to remove extraneous data. I also revisited the autobiographies and re-coded them and refined that data as
well. In the analysis of the initial interviews, I noted examples of critical events (Webster & Mertova, 2007) that students divulged. Critical events are moments that cause a change in perspective or understanding for students particularly related to their mathematics identity development and socialization. These critical events were used to guide second one-on-one interviews. I asked students specifically about these critical events that I identified to ensure they were truly important moments in their lives. Following the transcription of the follow-up interviews, a key piece of analysis was combining and grouping data based on different ideas such as specific times in students’ lives, specific mathematical experiences, and certain contextual factors. Once the data was combined, I connected the codes to previously identified critical events in order to organize the counterstories.

**Phase 3: Critical Race Counterstory Construction** In this phase, I developed initial narratives for each student. I did this by synthesizing various data from codes and by constructing stories around critical events. Counterstories attended to mathematics identity development and socialization relating to personal, school, community, and sociohistorical levels. Each counterstory began with macro- and meso-level discussion of students’ contexts. They then zoomed in on each student’s mathematics identity and socialization at the micro-level. I worked to ensure the students’ authentic voices were elevated in the counterstories by focusing on quotations and limiting my own personal commentary.

**Phase 4: Revisit Data and Revise Counterstories** After the first pass at a counterstory was constructed, I returned to the data to look for pieces of data that supported the stories I created. I also searched for data that provided a new perspective on the stories or disconfirmed what I wrote causing me to alter the initial narrative. I looked specifically for places where I
wrote my own assumptions rather than what the students actually said. This allowed me to revise certain aspects of each counterstory or to organize them around different critical events.

**Phase 5: Member Checking** After the final draft of the counterstories was constructed, I returned them to the students electronically to conduct member checking (Creswell & Miller, 2000). Students had the opportunity to read and revise the narratives I constructed. I also communicated with multiple students to discuss the ideas presented in their stories. I worked with them to ensure that the counterstories represented their unique voices. Following the member checking, final drafts of the counterstories were completed.

**Findings**

Here I present findings from my research that highlight the intersection of the context of rural Appalachia, mathematics education, and race and the need for research in this area. These findings are presented as Black students’ counterstories related to the racialized mathematics identities and socialization of six students in West Virginia. LaMarcus and Letitia live in Martin County in the southern coalfields. LaMarcus attends Hilltop High School with a relatively high proportion of Black students compared to the rest of the state while Letitia attends Creekside High School which is mostly White. Jamal attends Waterford Heights High School in the most northern area of the state. While he lives in a rural area, Terrell attends Academy High School in a large college town. Zahara and Yara are twins who attend Frederick High School in the north central part of the state. The students refer to Frederick as the most diverse high school in the state. All names and locations are pseudonyms and quotations are the students’ words with occasional parenthetical phrases in my words to add context. I organize these counterstories by first focusing on the macro- and meso-level influences, attending to each student’s unique rural Appalachian context. Then, I turn to the micro-level in order to describe the students’
mathematics identity development and the socialization experiences that shape their identities. At the end of each counterstory is a synthesis of each participant’s context, identity, and socialization.

LaMarcus’ Counterstory

LaMarcus’ Context

Located in the heart of coal country in southern West Virginia is Martin County. LaMarcus has lived in the town of East Branch, “a simple town” with a Family Dollar and a gas station, his entire life. It is a place with little opportunity for recreation or other activities, where you “are more likely to get … a four-wheeler or a dirt bike … than a real bike.” It is a rural area, and LaMarcus’ first descriptor for the town is “poverty.” His immediate surrounding community is made up of other Black people, and his school has “a pretty good mix of Black and White” students. This is significant considering the population of West Virginia is less than five percent Black/African American. While already known for its economic issues, Martin County became infamous with the election of Donald Trump and the rise of so-called Trump Country:

It might not be nothin’ like uh compared to what you see on CNN, but yeah. You have your rebel flags all the time especially when Trump came into office and said certain things … I had so many debates with some of the people I know…they be like “He (Trump) saved coal!” and they’ll say stuff like that.

LaMarcus describes the racial makeup of his community, “Yeah on my side of the county it’s pretty mixed, it’s pretty even. So there was no racial tension, no.” However, his experiences point to racism being an issue in his community. He mentions one memory from his childhood where he was at a sleepover with some friends. It was his first time sleeping over at a friend’s house, and they were playing superhero games when one boy got upset. He was upset because
LaMarcus was picked to go next, and the boy called LaMarcus a racial slur. The boy also swung a punch at LaMarcus, and they ended up in a scuffle. LaMarcus’ mother ended up picking him up after the fight, but he was able to return when his friend’s mother sent the other boy home.

As he has grown older, LaMarcus faces racial issues in other ways. The Confederate flag is common in his community, and he must deal with that when he goes to other people’s homes. This has affected his friendships and dating life:

I’ve had like multiple occasions where people have little rebel flags in their living room, their bedroom, and still expect me to like them and for everything to be cool. And I’m just like you got a whole rebel flag in your living room or behind your bed. She’s like “oh it don’t mean nothing, it’s just a flag it don’t mean nothing racist.” You know you got things that represent White history and all that stuff but at the same time there was so much bad that went involved with that fight that I’m just uncomfortable.

LaMarcus is usually able to recognize people who will have racist views and will defend White privilege and the Confederate flag based on their attire. But he cautions to not “be fooled by the cover of the book.” He avoided a classmate for a while because he “came in with the Wranglers and the boots and the whole country look.” But LaMarcus became friends with him after spending time with him through a mutual friend.

LaMarcus attends Hilltop High School, which is in a combined building with the middle school of the same name. He refers to Hilltop as a normal high school in West Virginia. LaMarcus likes his school, although he acknowledges that all schools have issues. While there is a relatively large proportion of Black students in his high school, LaMarcus still must argue with classmates and teachers about racial issues and White privilege. He says, “They don’t see racism like I see it. They believe there’s no such thing as White privilege anymore.” People in his
community cite athletics as proof that White privilege no longer exists. Discussing a conversation with an adult in the community, LaMarcus says, “He was like ‘when’s the last time you seen a White guy run the (foot)ball here?’” In class, he has had to deal with classmates believing he was undeserving of academic success and scholarships. LaMarcus says, “One guy goes, ‘You know you’re more likely to get a scholarship than me just because you’re Black.’” He responded with “it is what it is,” acknowledging the kid had a big problem with that. LaMarcus says that he hears the occasional “N word” at school but that it is not too often. But he always has to defend his opposition to the use of the slur. His classmates believe that if they have a Black boyfriend or girlfriend or listen to rap music that they should be able to say it. Referring to the arguments, LaMarcus says, “Nobody can really win because I mean in my point of view, yeah, I’m right. And in his point of view, I guess he’s right.” There are occasional fights between Black and White students around racial stereotyping, racism, and racist comments, but “it’s not like every month.”

LaMarcus believes Hilltop is seen as a “black cloud” by surrounding schools because of the relatively large proportion of Black students at the school. It is even an issue traveling on the other side of his county:

You travel through these places, and you take the backroads ‘cause they’re quicker. And now like going through Bennett … you got to go through that side of the county to get where we going to. It takes more than one hand to count the rebel flags that you see along the way. It’s just like “oof I hope we never have to stop.” Because we’re mostly a Black team, you know we play so many teams that don’t have any Black people so…

LaMarcus acknowledges the Whiteness (and racism) in surrounding communities as well as the perception of Hilltop by other schools that he has seen mostly through athletic competitions. His
team has had scuffles with teams from nearby high schools who are almost all White. “They’ll have a whole light skinned person on their team and we’re just like ‘hey man, you know your team is racist’ and he’s like ‘yeah, I know,’” he says. These experiences have made him more satisfied with his own school saying he’d rather be at Hilltop than anywhere else.

LaMarcus’ Mathematics Identity and Socialization

LaMarcus’ mathematics identity began to form in his early days in school. He says, “Learning math in elementary and middle school was difficult for me. For most of it I didn’t like any of it.” Many of his negative feelings towards mathematics come from an embarrassment that resulted from being asked to publicly solve procedural problems with speed. He states:

You had to worry about other people making fun of you for not knowing something. If you didn’t know the easy stuff people ya know had little giggles and stuff to say and maybe later on that day in the playground, you know, you do somethin’ and they be like “that’s why you didn’t know such and such.”

These socialization experiences led to a discomfort in learning mathematics that also affected his opportunities to participate in various activities as a young child. Even though LaMarcus said that his friends’ teasing of him did not bother him, he decided not to join the school’s 4-H club because “they told me you did math there.” One of his favorite things in elementary school was his after-school program, but a critical memory is a multiplication relay in which he had to compete:

We had this like multiplication relay. And I was only in third grade I hardly knew anything about multiplication. It was just like people saw me struggle out in the open and I didn’t like that. So after that I never really, I shied away from multiplication, and I didn’t wanna do long division.
This experience had a lasting impact on LaMarcus as he still avoids multiplication and division. He is intimidated by it and states that he still does not know how to complete long division, only knowing how to set up the problem.

Middle school presented different challenges for LaMarcus with multiple elementary schools feeding into Hilltop Middle. He discusses his nervousness entering a new school by saying, “You don’t want people thinking you’re the slow kid out of the bunch.” Because of his mathematics experiences and socialization in elementary school, LaMarcus de-identified with mathematics and avoided it as much as he could. At the end of LaMarcus’ sixth grade year, it was decided that he would enter remedial, self-contained mathematics classes. While not what he wanted, he did believe that his teachers and family had his best interests in mind. This allowed him to experience smaller class sizes where he could get more personalized instruction, and this led to more positive experiences and a more positive identification with mathematics. He says, “I had fun in class, and we learned stuff you know. So it was kind of a better feel.” But this move came with its own set of problems on a social level. LaMarcus realized that some of his classmates looked at him differently for going to different classes: “People will notice that you keep walking down the hall. You got turned at this class and people pick up on stuff like that.”

In high school, LaMarcus continued to have positive experiences in his remedial classes, and he has been completely comfortable with the level of mathematics, even calling the work easy. Referring to his classmates, he says, “I feel like they’re either right there with me or they’re even more behind than me.” Because of the ease with which he completed the work in his classes, LaMarcus was moved to on-level courses during his sophomore year in many subjects including mathematics. This mathematics class was a struggle for Lamarcus for a multitude of reasons. For one, he felt like he was behind the other students in his class. Also, the atmosphere
of the class contributed to his difficulties. He describes the class as “always loud, it was never quiet.” This would cause him to miss some of the material that the teacher went over. He talks about needing help the day after covering a concept, “I didn’t have it, and it’s like you try to ask him to like repeat his self and he might not do that. He’ll just give you like the worksheet and a little example on your worksheet, but that was about it.”

LaMarcus’ issues in mathematics class were exacerbated by a racist incident with another student in his sophomore year:

I had this guy … he said the “N word” and it went from like joking, like I said I don’t pay it no mind, but ya know he was joking and ya know and he was playing around, and he just end up pushing me a little too hard at one moment and it was just like, I … I snapped. And I pushed him right on back. And that turned into a little fight.

This led to a ten-day suspension from school for LaMarcus. After the suspension, he fell very far behind in his mathematics class. He mentions the need to complete “papers” in order to get caught up in the class: “When I got back, I had like papers to do. Like papers that I didn’t receive as I was suspended, and you know I kind of just like fell back.” This led to LaMarcus’ grades slipping and him returning to his self-contained classroom. While he continued to perform well in this setting, LaMarcus feels that his time in remedial classes has led to a lack of access to mathematics content that he perceives as important for college. This includes content that is found on the ACT. About the content on college entrance exams he says, “I can do certain things. My biggest issue is most of the math … I’ve just never seen it before.” He believes he has strong skills in real world mathematics and dealing with money, which he perceives as very important. This stems from his time working the cash register at a local store: “But when I had that job working the cash register counting like money and stuff, yeah, it helped me”
Synthesis

While LaMarcus views mathematics as extremely important, he still has developed a frustration from his time learning mathematics in school. It began from a young age when he was socialized to believe that publicly solving procedural problems quickly was the marker of success in mathematics. When asked what could have helped him, he replied, “I never got that extra attention, so growing up I just like kinda stayed in the back as far as math.” When LaMarcus entered middle and high school, he developed a more positive mathematics identity through his work in smaller classes with more individualized attention. When he returned to the on-level mathematics classroom, LaMarcus was socialized to believe that mathematics success involved turning in worksheets and keeping up with paperwork. All of these mathematical experiences were impacted by his context in a school with a high proportion of Black students. LaMarcus is graduating from high school this spring and plans to attend college. LaMarcus paradoxically views himself as good at doing mathematics and as a poor mathematics student (Jett, 2011). So even with his negative mathematics experiences, he is still planning to pursue a STEM career because of the importance he places on mathematics. This pursuit has been aided by his own perseverance, the support of his mother and family, and his participation in the after-school program. LaMarcus would have liked to be a cancer therapist, but he has decided on a career in exercise science because he believes it will require less mathematics which he “spent most of (his) time avoiding.” His lack of confidence in mathematics still shows: “Hopefully I can get the proper tutoring if I need it.”
Letitia’s Counterstory

Letitia’s Context

Like LaMarcus, Letitia was born and raised in Martin County; however, she attends Creekside High School on the opposite side of the county from Hilltop High School. She spent much of her childhood moving between the two different sides of Martin County: the side with Hilltop High School and a large number of Black people and the almost all White side with Creekside High. Her family ultimately settled in the predominantly White and rural area. Letitia describes her neighborhood: “Neighbors like to keep a lot of trash in their yard, so it made it look so bad, and then they have these animals. They just go around freely like they’re not kept in a yard … and they have chickens. It’s like a whole farm.” But the frequent moving allowed Letitia to become comfortable in both settings as she remembers liking the school on Hilltop’s side of the county. Her town of Beecher is definitively rural with a lack of stores. Letitia mentions that there is a post office, churches, and “that’s pretty much it.” She does not like living in a rural area as she says she would prefer to live in a city “where more stuff is happening and (is) more diverse.”

In her time in Beecher, Letitia has been surrounded by almost all White people, but she does not believe she has faced any overt racism. However, she knows that the people in her community are racist:

I don’t think I’d talk about Black culture around them. I just feel like they would say something because they’re real country. And I feel like some of them are racist. Like they said stuff to my friend but like they haven’t said anything to me. And teachers, they’re kinda the same too. The history teachers—cause their opinions are really different from mine.
This can make her uncomfortable in her community. She mentions an uncomfortable feeling at some community events. She says, “All of these people, you know (of) the same race, and then there’s like my family. I don’t know I just find it awkward.” She feels like people stare and gawk at her and her family because of their race and the fact that they are different. But Letitia tries to not let it affect her or what she does.

These feelings have all been exacerbated because of the popularity of Donald Trump, making race more salient to Letitia. She says, “I know some Trump fans and they’re nice people, but then I’m always having that thought in the back of my mind” about what they really think about Black people. The racism also carries risks for her safety with the abundance of firearms and guns in her community. Letitia feels strongly about gun laws and that people should not “just freely carry around guns.” She talks about seeing a person open carrying a gun at her job which elevated her fear of guns. Talking about the frequent threats of gun violence at her school, Letitia says, “They had to shut down school for a couple days. He really did have a gun and that you know, that scares you.” When discussing her rural community and its people, Letitia recognizes the uniqueness and peculiarity of her upbringing. She says, “See, I’ve always been saying, I’m like West Virginia is really different than these other states I’m seeing.”

Letitia’s Mathematics Identity and Socialization

Letitia’s mathematics identity has been defined by her perceiving herself as good at it and viewing it as her favorite subject. This began in elementary school when she was motivated to “outdo everybody else.” While she mentions being competitive, she simultaneously does not like competition in mathematics activities. She says, “I’d rather do what I want in my time.” But she has always done what she has needed to do because she has been motivated to be a high achiever even in elementary school. Even though her classmates have been almost all White, Letitia was
able to be comfortable in her school, especially because her elementary and middle schools were combined. She really hit her stride in middle school and really loved mathematics. She mentions her sixth grade teacher who made learning mathematics fun. Some of the activities were not related to mathematics such as the teacher bringing in pie for Pi Day. However, the teacher also provided rich learning experiences:

We did something trying to calculate like expenses. Like okay let’s say your job and how much you would get. And then you would calculate like Zillow or something what type of house you want and if you could afford it with your income and the type of car and just assets and everything. And I thought that was really fun. We were doing research and we were looking at these nice houses and nice cars.

Being able to connect mathematics to the real world made learning fun for Letitia and helped her to understand.

Another aspect of Letitia’s middle school mathematics learning was an online learning platform. This self-paced program was combined with classroom lectures in her middle school. The teacher would cover material, and then the students would complete problems on the computer. Letitia was able to complete her regular class activities on the program, and then she was able to work ahead. She says, “I would end up completing my level math and then start in the next level. So that’s when I thought that I was pretty good at it. They’re moving me up a level!” This platform was a big motivator for Letitia, and she strived to be the best in the class. It also made her think of mathematics as easy and fun. Online, self-paced learning was a good experience for Letitia, was a confidence booster, and made her feel proud to complete seventh and eighth grade mathematics material while in sixth grade.
Throughout her schooling, Letitia has been motivated by grades and her attempts to outdo her classmates. This became amplified in high school as the grades brought higher stakes including graduating with honors and college opportunities. This has led to a lot of stress which can affect her physically and mentally: “When I’m stressed out it’s hard for me to focus. It’s like my mind just goes completely blank, and I don’t know what to do.” This also applies to timed tests which she mentions, particularly at math field day competitions. Letitia says, “I don’t know if it’s like test anxiety, but when on timed tests like that I get really uncomfortable.” She also talks about added stress from external sources, particularly her family. While her immediate family has supported her and made sure she knew that grades were not the only important thing, Letitia often feels pressure from her extended family who lives outside of West Virginia. She says, “My family in North Carolina (is) always talking about me to people and my grades. I feel like I have to keep this up.” She appreciates the pride that they show in her, but she also recognizes that it causes her more and more stress. She feels a little like she let them down by not maintaining her perfect grades: “Always bragging like ‘yeah, she has straight A’s.’ You know I did have straight A’s, but I don’t anymore.”

Even though she is focused on grades in high school which causes her stress, Letitia still is very fond of mathematics. This has allowed her to continue achieving highly in the subject while still acknowledging the difficulty and seeming arbitrariness of some of the topics. She says, “High school now has a lot of stuff that’s unnecessary for you to learn. You just have to take it because you can’t graduate without it.” But she still enjoys it and attributes her ability to do well on her ability to seek help when she needs it: “I mean when I struggle, I ask for help so I can understand it more. And I think that helps me a lot.” She also is able to seek out assistance from her uncle who lives near her and who loves mathematics. When he would visit from
college, he would help Letitia with her mathematics. She clearly remembers asking teachers and her uncle for help with understanding graphs of functions and their roots or solutions. Letitia believes that asking for help is a big part of being good at mathematics. She says, “I think anybody can be good at math if you’re willing to learn and ask for help if you’re struggling.”

Letitia recognizes that many of her classmates do not like mathematics and do not consider themselves good at it. She also realizes that many people consider mathematics very difficult. Because of this, she feels special because she, her friends, and her teachers consider her good at the subject. She says, “The other people are like struggling with it, and I’m like, ‘Okay, I understand this.’ It makes me feel like okay well maybe I’m just smart.” Many of her friends lean on her for support and assistance in mathematics classes. This also increases her confidence, and makes her feel important:

When people started to ask me help with their math. That’s when I think I know all about the math. And then my friend told me that I was good at math. And I helped her, and I didn’t know if I was explaining it good to her. She said I did. And she told me she’s like “you’re good at math you know that?” I’m like, “Oh, thank you!”

She also has a positive reputation with her mathematics teachers which Letitia says is because she always asks questions and gets her work done. This made her stand out in her teacher’s eyes, and she gets special recognition from her teachers. She talks about a time where her teacher was trying to get students in her class to turn in work, and he turned to Letitia’s group and pointed and said, “I know all you get your work done.”

**Synthesis**

Throughout her life, Letitia has viewed mathematics positively and it has motivated her to achieve highly in her mostly White community and schools. While she has not faced much
explicit racism, she does feel the implicit racial tensions that are present in rural Appalachia, particularly during the Trump presidency. Although she has experienced this, she has been able to matriculate through school somewhat quietly when it comes to race: “I never really had any issues with my race and everything.” However, she knows friends who have been called the “N word.” She attributes her belonging at least partially to her academic success. Despite Letitia’s positive mathematics identity, she does not view mathematics as particularly important and sees it as more of a hoop to jump through to get through high school graduation and to college. She has been socialized to believe success in mathematics is so important that she is willing to cope with the stress it causes. She also has come to believe that success in mathematics is possible for everyone as long as they work hard and ask questions. Even though she does not deem high school mathematics as important, Letitia enjoys the subject and has worked hard at it because she believes that it has set her apart from her peers. Much of her positive experiences have been based on self-paced online learning platforms that have allowed her to work ahead through a procedure-based program. Letitia does not believe that mathematics has impacted her career plans. She plans to be a nurse practitioner with a specialization in psychiatry, and she does not foresee needing much mathematics in the future.

**Jamal’s Counterstory**

**Jamal’s Context**

Jamal lives in the most northern part of West Virginia in a suburb of the small city of Waterford. Jamal identifies his race as Black, but he notes that he started stating that he is mixed race in high school when he knew “more in depth” about race. He attends Waterford Heights High School, one of the largest and most diverse high schools in the state. Jamal describes his upbringing as being what he imagines to be much like a White person’s, particularly as he was
raised by two White parents (one biological parent and one stepparent). He lived in a mostly White neighborhood with “maybe two out of twenty” Black kids throughout his childhood, and he rarely hung around with them saying that they were more of “tag-a-long.” Waterford has many neighborhoods and suburbs, and Jamal lived in the Oakdale area most of his life. He now lives in Greenpoint. Oakdale and Greenpoint are approximately five to ten minutes from the downtown area of Waterford and Jamal mentions the stark differences he notices between students from his mostly White neighborhoods and those who live closer to downtown and in “The Heights:"

I know one other person that’s my skin color and that lives around me. But like there’s a bunch of (Black people) that live downtown. And like some of them dropped out like some of them. You know what “The Heights” is? Yeah, it’s divided.

Jamal considers himself “a natural competitor.” This showed itself at a young age through his love of football and sports in general. While Jamal lives in a mostly White neighborhood, athletics was a place where he has interacted often with other Black kids. This continues today. A large part of Jamal’s identity is as a football player, and he plans to play football in college. While he was often insulated from other Black children growing up, he played football with them, and this is where they formed bonds. He recites his high school football coach’s mantra often: “Team Wins, Brotherhood, All In.” Jamal also discusses the emphasis on colorblindness and togetherness in football. “It’s like no matter what color you are or where you’re coming from … at the end of the day, we’re brothers pretty much.”

Middle school marked a time when Jamal notes being affected by the culture and context of his school and community. He discusses the poor atmosphere at his middle school. While he liked his teachers, the school environment was overall negative. This mostly stemmed from
sexual assault allegations against the principal towards a teacher at the school. This caused Jamal to want to transfer to a private, residential school called Lafayette for the year:

At the time eighth grade was a really bad year. I was trying to go to Lafayette. It was a bad environment. I didn’t like what was going on. I asked my parents if I could leave.

There was something going on with our principal and he like got charges and stuff.

While Lafayette accepted Jamal for his ninth grade year, he felt as though he had made it through and was ready to attend Waterford Heights High School.

Things changed when he entered Waterford Heights. First, Jamal was no longer with only the same people he grew up with. He moved outside his bubble, and he was also surrounded by more Black students than he ever had been. His freshman year was marked by a major event and the ramifications for Jamal are still felt today. The school had a so-called “race war” between White and Black students that was fueled by social media. This conflict impacted all aspects of Jamal’s schooling during his first year of high school:

I remember … I was eating lunch and apparently this girl called this Black girl the “N word.” There’s a couple of them that came in and they just jumped this girl. And they were just like beating the heck out of her. It was crazy and all around just kinda scary. I mean I didn’t know if I was safe or if I was cool. I just didn’t go to school that Friday, I think? And there was a big brawl at the ice rink. It was on everyone’s (social media) stories. Someone threw a bench at a dude.

Things were so violent and intense that the school administrators had to adjust the bell schedule for the rest of the year to avoid some interactions among students, and the story made national news. Jamal mentions the fact that students had to choose sides between the Black students and the “hicks.”
While the daily fights and violence did not continue indefinitely, the ramifications have continued to be felt throughout his high school experience. Jamal says, “I feel like some of that still goes on today, though, but it’s just like not as big you know what I mean?” At the beginning of Jamal’s sophomore year, Waterford Heights had almost a complete turnover in administrators. They began the school year with an assembly laying out expectations for the year. Instead of addressing the use of the “N word” and other racist and violent acts, the message was more of “like knock it off.” There were meetings and assemblies (some presented by police officers) aimed at talking about race, but students were not required to attend. Presently, Jamal talks about how racist language is handled at the school: “There’s this kid, probably my size but he weighs like a little bit more than me, and he goes around and pretty much fights people that are saying the ‘N word’ and stuff like that.”

Football provided a sense of comfort and solace for Jamal. It fed his competitive nature, and it was a place he and his teammates could come together and where racial tensions seemingly did not exist because of the notion of brotherhood. Jamal says, “Like with me and my groups are like athletes. We don’t like see color–I mean especially like with Coach Todd. It’s like no matter like what color you are or where you’re coming from uh you come here and work just as hard as everyone else.” However, even though football gives him a chance to connect with Black teammates and there is a sense of camaraderie between White and Black players, racism still rears its head. A White teammate was recently under fire for getting “exposed on social media … he said the ‘N word.’” Jamal discusses his reaction to this, “I mean I’d look at him different, but like I was a leader on that team. I’m not gonna like come at him and try to like do something dumb.” Jamal sees his teachers having similar qualities as his football coach in their classes at Waterford Heights. But there is less explicit emphasis on togetherness and more
on supposed equal treatment of students. Jamal talks about their colorblindness in a positive way:

“I think there’s some teachers like that, but they don’t like … come out and say like they don’t realize they already assumed that should be like set in the classroom.”

**Jamal’s Mathematics Identity and Socialization**

Jamal felt naturally inclined to mathematics as a child. He even says that people used to call him “the numbers guy,” an identity in which he had pride. He also really enjoyed the subject and attributes this to his attraction to the competitive nature of the subject in elementary school. He says, “We learned it from competition. There was always some type of winner and therefore people would end up wanting to learn it” when discussing multiplication tables done for speed and accuracy. He remembers the visual display of a rocket ship showing his progress in learning multiplication and the games he played to learn the names of shapes. One teacher in his elementary school worked with some students, seemingly the “high achievers,” to enrich their sense of numbers. Being pulled out of his classroom to work with Mr. Seacrest was Jamal’s first (and one of few) recollection of using critical thinking in mathematics: “He taught them like quick ways to get the math problems. He taught me how to like get to ten like tens if I’m like adding up two things.” Jamal was able to illustrate by adding fourteen and sixteen. He says this work has helped him to be “light on his feet” when solving problems. Another positive experience from Jamal’s childhood was spending time at the community soup kitchen with his aunt who volunteered. Jamal would play with other children at the kitchen and “the top person there would do activities with me and help me with my math and everything my first couple years.”

While most of Jamal’s experiences with mathematics in elementary school were positive, things changed when Jamal got to middle school. His middle school divided students in each
grade level by “tiers.” These five tiers separated students in different homerooms by perceived ability level (five being the “highest” achievers), although some teachers and staff attempted to keep this fact from the students. They were able to easily figure this out for various reasons. Jamal started out middle school in Tier 2, but he was able to quickly rise up to Tier 4 based on his performance on mathematics tests:

It was because I was doing so well in math my sixth grade year. There was like three spans of tests, and I was the only person in like the whole grade that was getting like ninety pluses on them. I think one test I got 100 on and no one else even came close and then they moved me from that. One of my favorite math teachers of all time was telling me like “this is why, you see this right here?” and then showed me the paper. She said, “This is why we’re moving you homerooms.” And then I just pieced it together.

Being able to move tiers improved Jamal’s perception of his own abilities in mathematics and made him confident that he could challenge himself further.

Thus, when entering eighth grade, Jamal was eager to take high school mathematics to get ahead: “I wanted to start early for like my college credits.” He says that his other White friends were able to choose which mathematics course they wanted to take, but only Tier Five was allowed to take high school mathematics. Jamal stated his desire to be elevated to the high school mathematics class to multiple teachers, and they continued to say they would take care of it. He says, “She (his teacher) said ‘I’m gonna work on this, I’m going to get back to you on it.’ I asked like three different times throughout the year, and it just never happened.” This was very discouraging for Jamal and signaled a shift in his perception of his ability and interest in mathematics. He previously cared and was confident about his performance in mathematics classes, but after that he “didn’t really care anymore.” Describing the deflating nature of this
time he says, “When you tell a kid that you’re going to do something, especially at that age, you know what I mean?” This was all exacerbated by the atmosphere at his middle school which was negatively impacted by the principal’s scandal.

In the midst of the “race war” and the administration’s attempts to move beyond the violent racism, Jamal continued to achieve in mathematics classes, although his enjoyment of the subject varied. He took algebra in ninth grade, and it was “pretty easy” and “gelled (Jamal) back with math” after his negative middle school experiences. However, he returned to negative experiences his sophomore year: “What really turned me away from math was when I had geometry my sophomore year. Geometry was just me like mentally like I’m just not picking something up.” Jamal’s geometry course was focused on memorization (he would need to memorize all equations for quizzes and tests) and repetitive solutions of equations by the teacher. He says, “I understand, like he knows how to do the equation, but I don’t know what I’m doing.” Jamal views geometry as the “final straw like I’m not, I’m not the best at math.” Returning to an algebra-based course his junior year, returned some positive feelings. The course began with a review of Algebra 1, “then slowly progressed towards like doing more things.” Jamal discusses his enjoyment of the advanced algebra class, “You could kind of see how things connected and build on each other, and yeah that’s what that’s why I like how they pieced it together. They told you why this is happening, and not just the final product. Yeah, memorization is not the best.”

**Synthesis**

While Jamal had some positive mathematics experiences in high school, they were impacted by external factors that made it difficult to gain any traction in his mathematics learning (Walker, 2012). Jamal’s experiences were deeply affected by the sexual assault allegations and school environment in middle school as well as the “race war” his freshman year.
After that, students in West Virginia were out of school for a period of time while teachers went on strike, beginning a wave of labor movement across the country. The switch to remote learning during the COVID-19 pandemic definitely impacted his mathematics learning specifically: “I just feel like they were giving us work and they’re just like here do it, and then this year they’re just like this, trying to go fast.” Throughout his schooling, Jamal was socialized in mathematics through competition, and he believed that scoring well on tests and in other activities was a sign of success in mathematics. This helped Jamal to develop a positive mathematics identity in elementary school, but it negatively affected him in middle school as his test scores were not enough to get him to the highest tier. In high school, Jamal de-identified with mathematics mainly because of the way the subject was taught, particularly when learning geometry. The inauthentic instruction of his geometry class made him believe that he was no longer a mathematics person. As Jamal prepares to enter college, he acknowledges that his identification with mathematics has affected his career path. He says, “Back then I thought I was really good with numbers and everything I kinda wanted to be like a teacher. I just wanted to help kids. The best thing to do right now is probably become like an athletic trainer or like study exercise science” so he can be required to do less mathematics.

Terrell’s Counterstory

Terrell’s Context

Terrell lives in a rural area outside of the relatively large college town of Merrickville. While the town itself has some diversity with a large university and multiple hospitals being major employers, Terrell’s experiences have been in mostly White spaces. There are schools in Merrickville that have fairly large numbers of Black students, but almost all of Terrell’s
classmates have been White. This includes his best friend who he grew up with and with whom he did what he refers to as “White activities” in his remote community:

That’s what I was doing growing up, I was out in the woods like hunting and fishing and riding dirtbikes and stuff like that. That’s just what I enjoy that’s what I grew up doing because I don’t live in the city limits like I can do whatever I want. It’s not just White people stuff, Black people like to do that too. You shouldn’t put it in a box.

Terrell questions whether it is okay for him to call these “White people stuff” because he wants to be mindful that he is being inclusive. He also mentions the fact that many of his classmates and friends are surprised that he partakes in these activities. He talks about coming to basketball practice with boots on and his teammates will say, “‘What the heck are you doing man?’”

Terrell believes that growing up in a rural area and doing these typical rural activities has helped him to fit in more with his community and White classmates. Since many of his friends who live in rural areas do the same things, he is able to relate to them. However, Terrell also mentions the fact that being in a mostly White community poses difficulties, mentioning that he has felt sort of like he has had to “pick a side” between White people and Black people. This is especially salient because there are areas of Merrickville with more Black people. He says, “There is a good amount of Black people in Merrickville, like it’s starting to get more diverse. But like it’s definitely hard because—well different—because you don’t see a lot of people the same color as you. So there’s not a lot of people that you can relate to.” The more time he has spent in his community, the more he has been able to relate to his White friends. But he notes that he has experiences that they will never understand. He mentions “the talk” his parents had with him when he first started driving about staying safe from the police if he gets pulled over. He would ask his friends if they had the same talk with their parents, and they all said, “Nah,
what are you talking about?” Because of this, he mentions that he sometimes gravitates towards other Black students at school and particularly in sports. When talking about the one other Black player on his basketball team, Terrell says, “We just like kinda stick together more than I would with anyone else.”

Terrell’s middle school has a reputation of being a poor performing school. When it funnels into the high school, there is a negative perception of the students who come from Eastland Middle School. It is also a school that is mostly White. When Terrell was in eighth grade, his brother entered the school as a sixth grader. Terrell’s brother had long hair and wore a bandana to keep the hair out of his eyes. The administration of the school made Terrell’s brother remove the bandana as they said that it violated the dress code. But Terrell and his brother pushed back against this:

They were like “Take that bandana off, you’re not in your gang around here.” Like one of the teachers said that to him. And he said, “No I’m not going to take it off” and, uh, they were like “well that’s gang-affiliated.” He said, “If I can’t wear my headband then that kid shouldn’t be allowed to wear a rebel flag on his shirt.” I stood beside him, and we took it to the office with him and eventually they told us that we weren’t allowed to wear bandanas. We had the whole school wearing bandanas.

Terrell was struck by the hypocrisy of the school allowing racist symbols on clothing while also assuming that a Black student’s bandana was gang related. Terrell acknowledges that there are racist people in his school and community but attributes it mainly to a lack of knowledge and them not being around many Black people. He also says that mainly his school experiences have been very positive and in high school in particular there have been “good vibes.”
Terrell’s Mathematics Identity and Socialization

In elementary school, Terrell never had a Black student in his class because of living in a rural community. In fact, he has only had three mathematics classes his whole life with someone else who is Black due to the racial makeup of the schools he has attended. But that did not hinder Terrell’s identification with mathematics in elementary school. He loved learning mathematics then, and he thought it was fun. He always pushed himself to do better and better, and he enjoyed the many competitions that went on in his elementary classes. He considered himself one of the best mathematics students in his grade, and he really loved all of his teachers in his early years. He says, “Every teacher I had, they just like pushed me to the best of my ability. I was just like there for school. I was there to learn.” Terrell was very committed to school as a young student, driven by his desire to be the best and the support of his family. His mathematics learning was also supported by the use of hands-on activities that helped him to visualize operations. For example, Terrell recalls a time when he was learning to divide by using pennies. He had ten pennies to perform ten divided by two. He says, “Five five, you know what I’m saying? Like those are the hands-on I understand. Like this has to be over here this has to be over here.”

Things changed some in middle school, though. Terrell still loved mathematics and wanted to do well in school. But his interests changed. He was no longer just “there to learn.” He talks about how his life changed with adolescence and a change in schools:

In middle school you start playing sports, you start like hanging out with like trying to fit in to your crowd. And it was just like not that I was a bad kid … but it’s just like I was like “eh it’s school.” Like “nah I’m going to the NBA I don’t need school.” I just like tried to just slide by, just meet the requirement. I didn’t exceed the requirements like I did in elementary school.
This caused Terrell to lack some motivation for school and mathematics in particular, especially as it got more difficult and more serious. He talks about the fact that mathematics was no longer fun, and it came time to “buckle down” as mathematics education became seemingly more high stakes. This shift in his view of mathematics was accompanied by a difference in the way it was taught to him. Instead of the memorable hands-on activities, Terrell mentions that mathematics became all paper and pencil.

Middle school was also the time that he began to become self-conscious and think a lot before he spoke in mathematics classes. He talks about the fact that he would not raise his hand to answer questions because he did not want to get the answer wrong. This is a phenomenon that followed him throughout the rest of his schooling. He has hesitated to speak up in classes with the fear of bringing unwanted attention to himself. Terrell initially denies that this has to do with race, but then he explains, “It was different. I don’t want to say anything because they’re already looking at me because I’m the only Black kid in the class.” So Terrell has decided to stay quiet most of the time and just complete his work without drawing attention to himself.

Terrell’s competitive spirit and family pressure/support has carried him through high school, even though his mathematics learning experiences have not been positive. He says that he has not really liked mathematics in high school as it has continued to be based entirely on paper and pencil work and procedural knowledge. He also mentions a lack of enthusiasm from his mathematics teachers. He says, “I would say being a high school teacher is definitely hard. They’re just trying to ‘alright this is what you have to do this is what I’m required to teach you that’s what I’m gonna do.’” It seems as though Terrell believes the seriousness of mathematics has affected his and his teachers love of the subject. But he stays motivated to achieve highly
because he connects mathematics to money and getting a high-paying job. Explaining this, Terrell says:

In high school, math has been a subject that I really don’t like. But I do like money and want to be successful in life. So I told myself I need to pay attention in this class in order to have a good life and future. I kind of made myself like math because I either want to study civil engineering, mechanical engineering, or business. Either way you need math because you’re always going to be dealing with numbers for the rest of your life.

This view of mathematics is consistent with how he sees power structures functioning in the United States and the world. Terrell believes that money, and in turn mathematics, rules everything, and that the government is really run by billionaires such as Mark Zuckerberg and Elon Musk because of their ability to generate revenue for the nation.

Seeing the importance of mathematics for many careers, Terrell always felt like he had to force himself to do well in high school. In his junior year, he had a mathematics class with many of his friends. This caused him to pay attention a lot less than he normally did. During the first semester, Terrell struggled a lot and his grades dropped. During the second semester, he made a deal with himself and his friends to “actually do our work for once and like stay on top of our stuff.” That day, he took notes and was able to answer the difficult questions in class. This changed his perception of the class, and he was able to help his classmates with the material. This made him feel good and made him enjoy the class, but he says that this feeling was very rare in his mathematics classes.

**Synthesis**

Terrell’s mathematics identity has been shaped by his competitiveness, his drive to be the best that he can be (aided by his parents), and his desire to get a good job (and make money)
after college. These external motivators have socialized him even when the mathematics became more serious and less fun in later years of his schooling. His later mathematics experiences centered on procedural learning that was pressure-filled as success in the subject equated to broad academic success. So he made sure that he was good at mathematics even when it was not enjoyable, which was most of the time. His socialization was also affected by being a Black person in a rural area and being surrounded by mostly White people. This caused him to take up so-called “White” activities so that he could fit in with his community. But even so, he feels as though he has been looked at differently as a Black person in this space. He mentions the difference he sees in his family from the South who are around Black people often:

My cousins down there, we all like fit in and everything. We can have a good time together, but they act way different than I do. And that’s just because they’re around more Black people than me. That that’s just their culture down there you know? It’s just different. Rather than up here, you know I don’t see any Black people.

While he feels like he fits in in both cultures, Terrell recognizes the difference in being one of the few Black people in his community. While Terrell has always considered mathematics to be important and himself as successful in mathematics, he has not enjoyed it and his experiences have been shaped by being a Black student in a mostly White space.

**Zahara and Yara’s Counterstory**

**Zahara and Yara’s Context**

Zahara and Yara are twins who live in the north central part of West Virginia in a town called Frederick, and they attend Frederick High School. They have lived most of their lives in an all-Black community in the town surrounded by people who support them and their schooling. This community of like-minded people has helped the twins to feel safe physically and
emotionally. This has been especially important with the rise of Trumpism. Zahara and Yara noticed that all of their neighbors had political signs supporting Joe Biden and Kamala Harris, and this allowed them to know where each of their neighbors stood on issues that are important to them. Zahara contrasts her community to other places in West Virginia: “I know there’s a lot of towns in the South that Black people live in, but all their neighbors will be Trump supporters and they don’t like feel safe. So I guess it made me feel safer.” Yara says that living in a mostly Black community has been good for her because “you feel like you’re not alone.” But the twins are keenly aware of the political climate elsewhere in their town which makes them want to move to a larger, more liberal town or city. Yara says, “I don’t like how the elections go and the political atmosphere here.”

Their town is districted such that the elementary school that Zahara and Yara were slated to attend was actually farther from home than a different elementary school. In order to decrease the commute time, Zahara and Yara’s mother submitted another family member’s address to the district so that they could attend the closer school. The result of this was that the twins attended a school that was predominantly White, while other children in their community attended a different elementary school. This did not have a profound impact on the twins at the time, but looking back they are able to recognize some of the subtle racism that manifested there. Zahara mentions that she thinks sometimes the Black students were punished more harshly. The twins also recall a time when they brought in a picture of their family to their teacher. In the picture were Zahara and Yara along with their younger siblings. They mention that their siblings are “a lot lighter skinned than us.” The teacher, noticing the difference in skin tones, asked the girls if those were actually their siblings. The twins did not think anything of this at the time, but their mother recognized the racism at play. She said to the girls, “Why in the world would she ask you
that?” Looking back, Zahara is able to recognize the racist thoughts that make this type of question common. She says, “There are so many different types of families like even if it’s a White family with like a Black adopted child. I would never like ask someone if that’s her sister. They’re in their family picture.” The twins also believe it may have had to do with beliefs about the familial relations of Black families. Zahara says that a lot of people would ask their mother if the twins and their sisters had the same father. She says, “We do have the same dad, it’s just genetics.” But Zahara and Yara give this teacher the benefit of the doubt because they still see her and are close with her granddaughter.

In middle school, the twins attended a more racially diverse school. Zahara and Yara think fondly of their time in middle school, but they recognize that much of the experience was focused on fun activities instead of academics, particularly in their eighth grade year. They mention being able to get their teachers off track and taking a lot of field trips. Middle school is also when the twins began to form their racially diverse friend group that has shaped their world views and academic identities. This group of friends values good grades, preparing for college, and their diversity. Being in the honors track in middle and high school, Zahara and Yara have had almost every class with the same group of friends. This allowed them to form an insular group to many outside forces at their school while being able to focus on their academics.

Zahara and Yara have faced issues of racism, but they have not been common. Zahara recalls a time in middle school that the twins’ cousin was called the “N word.” This was handled swiftly by the social studies teacher at the time. “It made her really upset,” says Zahara. The twins recognize the seriousness of the slur. One says, “People act like it’s just someone cussing … and not actually saying like it’s hate speech.” So they appreciated the reaction of the teacher. This teacher, Ms. Turner, was the twins’ favorite teacher in middle school, and they have
remained close with her throughout high school. More recently, though, they have learned about her political stance which has made them question what she and other people truly believe about them:

She like kicked him out of class and wouldn’t let him come back in there. It’s weird because she is Republican, and she votes for Donald Trump. But she like loves all her Black students. I wouldn’t say she’s racist at all, but like you know that makes you think about how people actually are like at home and stuff.

While they acknowledge that it’s problematic for someone close to them, and particularly a social studies teacher, to support the views of Donald Trump, they accept her views and recognize how good she has been to them and other Black students on an individual level.

In high school, the twins continued to be close with their friend group who has had a profound impact on their experiences. This allowed them to never feel alone or singled out, especially considering the racial makeup of their school. Zahara and Yara continually make note that Frederick High School is the “most racially diverse” in the state. And they also take care to mention the type of diversity. While there is a large proportion of Black students, there are also Asian and Latinx students in their friend group and throughout the school. While academics are the most important aspect of their lives, Zahara and Yara also participate in extracurricular activities. They run track, which they enjoy, but their favorite activity that they are most committed to is dance. They have attended a dance studio run by “Miss Sharon” for most of their lives, and it has been a large part of their upbringing.

While in high school, Zahara and Yara auditioned for a select summer program for the arts. Other students at their studio were selected for the program, but the twins were left out.
Miss Sharon was able to watch the auditions, and she acknowledged that Zahara and Yara deserved to be admitted over the other students, who were White, who did get in. Zahara says:

She thought we should have got in. So she called them racist and like was saying all this stuff and got all these people mad. And she was saying that and then they were saying if someone drops how both of me and Yara could go. And she was like, “So you guys think that two Black people are worth one White person?” And like she was literally being anti-racist.

This meant a lot to the twins. They were ultimately accepted to attend the program, but they opted against it. They had already planned a vacation with friends, but also, they did not want to be known as the Black people who had to fight to get in. They recognize that there has been little racial diversity in this program as “the year before there was only one person that was Black and only one Black person got through” the year they auditioned.

While these actions led to Zahara and Yara becoming even closer with Miss Sharon, it also led to a dissonance related to her beliefs. The twins have since learned that Miss Sharon is a Trump supporter which has led to many arguments between them when the twins would bring up the issue of Black rights and humanity. Miss Sharon mentions the economic impact of having Trump out of office as the reason she supports him. Zahara says:

She was worried about like her taxes going up and we’d be like you have the money to pay the taxes. Someone’s life is more important than taxes. Like Black people being killed in the street is a bigger problem than you having to pay a little bit more in tax money.

But again, the twins try to overlook Miss Sharon and Ms. Turner’s views as best that they can. Yara says, “I just try to ignore it like I just don’t think about it when I’m talking to them. I try to
… put it in the back of my head. It’s weird that she would not like vote for something in my best interest and stuff. And still know she loves me and stuff.”

This dissonance defines many of the twins’ interactions. They recognize the difficulty in balancing their own political views about systemic racism, the way they are treated individually by others, and the political beliefs of those White people who are very close to them. Zahara says, “We just thought that (taxes) didn’t matter as much as human rights and like the right to marry and police brutality so sometimes it just seems like so trivial. All their concerns … compared to ours.” While they do face this subtle racism, the twins recognize that in their area of West Virginia, things are better than other places in the region.

Zahara’s Mathematics Identity and Socialization

Zahara’s mathematics identity has changed throughout her schooling. She started out in elementary school really enjoying learning mathematics, and she found it very fun. She mentions that she liked all of her teachers in these years. But elementary school also started a trend in her mathematics learning: the need for memorization. Her second grade teacher “had a bunch of things to memorize.” While she liked this at the time, she realizes now that this did not help her with the foundations of mathematics or number sense. She describes a method for adding numbers by creating doubles, but she says that she figured that out on her own and was never taught number sense. Zahara considered herself smart during her elementary years, and she was able to complete all of her work at school while being supported by Yara and her mother if she needed help. One thing that stands out to Zahara was being left out of the talented and gifted program. While she does not remember being upset or angry about not being in the program, she questions it now: “We were always still smart through elementary school and middle school, so I didn’t, I don’t know. Because we still got good grades, so I don’t know.”
In middle school, learning mathematics remained easy for Zahara. She was able to complete most of her work at school, and she was able to maintain her good grades. However, her mathematics classes became less fun for her, mainly because of her desire for creativity. Middle school mathematics was focused on procedures and memorization, so Zahara began gravitating to other subjects in school “because there were less concrete answers and more room for ingenuity.” Zahara had one of her only Black teachers as a mathematics teacher in eighth grade. She loved the teacher, Mr. Owens, and this allowed her to feel comfortable asking questions and speaking up in class. She had a lot of fun in this class, but it was less focused on mathematics. She says, “We took a lot of field trips and we like traveled a lot.” But this was not without consequences. Zahara does not feel as though she learned much mathematics in middle school, particularly in her eighth grade year. She says, “I feel like eighth grade and middle school didn’t really prepare me for ninth grade.” This was especially true as she was placed in the honors mathematics class in high school because she performed well on a qualifying standardized exam.

Zahara was happy to be placed in Math 1 Honors in her freshman year. This allowed her to be in class with her sister and the rest of her friend group. But her experiences were not necessarily positive. The thing that stands out to Zahara was the fact that she got her first ever B in that class. She attributes this to her lack of preparation from middle school, her inability to understand new things, and the lack of review of previous material. This affected her enjoyment and willingness to learn mathematics. She says, “In high school, math started to get harder for me, and I got my first B in a math class freshman year. When I didn’t understand new concepts that my peers picked up quickly, it became a lot harder to learn and be motivated to learn math.” Still, she is happy that she took the honors courses in mathematics because it pushed her to work
harder and to learn more. She also felt the comfort of being with her friends who could help her. Zahara mentions that she wishes that there were more hands-on activities and use of manipulatives in high school, saying, “I think it helps when learning a whole new concept ‘cause you have to start from the basic and everything.” She also enjoyed specific aspect of mathematics: proofs. Completing proofs allowed Zahara to use her creativity, but it also allowed her to gain understanding of basic concepts of mathematics that she believes she was previously blocked from learning. She states that using properties to solve problems and listing them out helped the material to crystallize for her.

**Zahara’s Synthesis**

Zahara continued in honors mathematics courses throughout high school, although her joy in learning mathematics continued to wane while her enjoyment in other subjects grew. Her mathematics identity changed when her experiences were focused around procedures and not on her love of creativity and problem solving. She enjoyed English and science because they allowed her to take pieces that she learned, use her ingenuity, and put them together to solve problems or construct writing. She says, “I like writing essays and stuff like that, so I guess math was just harder because I had to find like that one specific answer.” She also mentions that it would have been helpful to learn about different methods for solving problems to foster creativity. Instead, Zahara was socialized into believing that mathematics problems are completed by rote memorization in only one way. Because of the lack of creativity, Zahara does not want mathematics to be a big part of her future. She is going to major in nursing, which she recognizes is in STEM, but she is happy to not have to take many mathematics classes. She is actually completing her lone mathematics class the summer before her freshman year of college, “thankfully.”
Yara’s Mathematics Identity and Socialization

Yara’s journey through mathematics is similar to Zahara’s; however, her views of mathematics have been different. Like her sister, Yara really enjoyed mathematics in elementary school, and she believed that she was good at it. She recalls being in elementary school and using blocks and manipulatives, and that was fun for her. Describing these activities, Yara says, “I remember the little blocks we used to use that we like put together and like counting by tens and stuff like that … yeah tips and tricks.” These activities established an understanding of mathematics that has carried her throughout her schooling. She also remembers thinking of herself as smart, although grades were not a focus of her life in elementary school. She says, “I don’t really remember report cards from elementary school. My mom says we got all A’s, but I don’t remember even looking.”

In middle school, things became a little more difficult for Yara with more of a focus on algebra, particularly the use of variables. She describes this experience, “When we started using like variables and stuff like that … just learning the basics of that was kinda hard because it was completely new. But now it’s like something you don’t even think about.” She was able to pick up on these new concepts easily with the help of a teacher who she says was “really good at giving us metaphors to use and stuff like that.” This allowed mathematical concepts to “click” for Yara in a way that they didn’t for Zahara. Yara remembers talking to her sister and saying, “I don’t know what you don’t understand about this.” Middle school also was the start of Yara’s desire for good grades. She began to really care about this in eighth grade, but this was okay because mathematics was still fun for her. She also recalls doing a lot of notes in her middle school mathematics classes, something which she really liked.
Taking notes continued into high school, but to Yara it seemed like that was all they did. The hands-on activities that she enjoyed in elementary and middle school were gone. She says, “When you got to high school it wasn’t like fun anymore. I mean we still did some like activities and stuff, but the material got harder. So we didn’t like that we couldn’t do as much.” When she did activities, though, they seemed to be based in art, something which she did not want to be assessed on. She describes creating kites in her mathematics class, which she describes as “fine” as long as she was not graded on her drawing. A focus on grades has been a big part of Yara’s mathematics identity. She has felt good about her learning as long as she has gotten good grades. This has a lot to do with the pressure that she puts on herself. While she does not feel pressure from family or external factors, she has stressed about being able to get into college, to perform well on standardized tests, and to get scholarships. Describing her motivators, Yara says:

My mom doesn’t like force us to get good grades or anything. She never has. Like I guess it’s just me. I guess I just like to have good grades, and I just wanted to be successful. Like not have to worry about paying for college and stuff. I wanted to get into the colleges I wanted. Like I wanted my applications to look good and stuff like that.

This compulsion to get good grades also affected the way Yara has viewed mathematics. In order to ensure she has earned good grades but also with the goal of spending little time on it, she would often cram to study for her mathematics tests. While this would often lead to performing well on tests, sometimes she would do poorly which would lead to stress for the rest of the grading period. Either way, she did not like the cramming saying, “I didn’t feel good about it.”

Still, Yara has considered herself good at mathematics at least until she began to study trigonometry. She attributes her struggles in trigonometry to the fact that she studied it while doing remote learning because of the COVID-19 pandemic. However, she does not see her lack
of understanding of the topic as a problem for her future. In fact, she does not find high school mathematics particularly important at all. Yara says, “I can’t see myself using trigonometry or anything in like life, not college. Or like not on the SAT and ACT.” She says that some may need it if they have some “crazy coding job or something.” But for her as someone who is pursuing a career in nursing, it does not really matter. Yara does see the value in doing mathematics to prepare for a standardized test as “for any profession you have to take some type of test, certification test to get into it so I guess that’s what we should be doing.”

**Yara’s Synthesis**

Yara wishes that she would have enjoyed high school mathematics more than she has, and she says that part of her dislike is that her teachers always feel pressure to cover more and more material. This has led to her and other students not really understanding but just getting by. She wishes it was different and that teachers could decide what was important for them to teach rather than a board of education or some other entity. Talking about problem solving and addressing real world problems, Yara says, “If we weren’t worried about the testing, we could probably do more of those.” Still, Yara considers her learning experience in mathematics as positive, especially because she has been surrounded by her friends who have supported her, including Zahara. She says, “We hang out with good kids who get good grades and stuff like that.” The social networks that Zahara and Yara built have had a positive impact on their mathematics identities (Gholson & Martin, 2014), but their socialization experiences have limited their enjoyment of mathematics. Yara is ready to go to college in order to get a nursing job, and she is thrilled to not need any more mathematics classes to do so.
Discussion and Implications

Macro- and Meso-level Influences

The context of rural Appalachia has a profound influence on Black students’ racialized mathematics identities and socialization, and their experiences are also affected by the characteristics of their unique Appalachian communities. The main tenet of CRT is that racism is endemic in American society, and that is definitely true in rural Appalachia. This racism takes many forms, and it is implicit and explicit. Black students are affected by their school and community environment as well as the larger political and cultural climate in the state and nation. Whiteness is powerful, the norm, in the region, and it shapeshifts to function differently in different communities in West Virginia. Black students find different ways to navigate this and to preserve themselves in their lives and in their schools. And this all has a profound impact on their mathematics learning.

At the time of this study, the presidency of Donald Trump dominated the discourse in West Virginia. He won seventy percent of the votes in the state in the 2020 election, and he also won every county in the state. In the county where LaMarcus and Letitia live, Trump won nearly eighty percent of the vote. Only in Terrell’s county and two other counties in the state did Trump win less than sixty percent of the votes (POLITICO, 2020). These students acknowledge that Trump is racist and has spouted racist ideas from the highest position of power in our country, and they also believe that if a person votes for him that they are at least ignoring this racism. At worst, they see Trump voters agreeing with the racist ideals and being happy with the fact that he is amplifying them. While there are a large number of people in their communities, including many of their peers, who do not support these ideas, the students encounter Trump supporters every day in their communities and in their schools. They may be their teachers, their neighbors,
or their friends’ parents. Black students in this region must always reconcile the feelings that come with the knowledge that a person is or may be racist while also treating them individually in a certain way. LaMarcus mentions the overwhelming amount of Trump and Confederate flags in his community. Letitia talks about the prevalence of guns and racism. Zahara and Yara discuss the economic arguments that those closest to them have for voting for Trump. These students have been socialized in a way that signals to them that Whiteness, taxes, firearms, symbols of the Confederacy, and other things rooted in White supremacy are more important than their own humanity. This is a constant struggle that they must deal with, and they often must try to ignore this dilemma while still keeping their guards up. They often ask themselves, “How can someone closest to us vote in the opposite of viewing us as human?” However, there are pockets of thriving Black communities in West Virginia where students can feel safe, including the community in which Zahara and Yara live, and know that their humanity and well-being is held in the highest regard. It is essential to amplify the voices who value these students’ humanity.

While some of the racism coming from Trumpism is subtle, there is also rampant open racism occurring in rural Appalachian schools. Black students are continuously called the “N word” openly and freely. At times, this leads to physical altercations between White and Black students. On rare occasions, this violence progresses to a full blown “race wars” in schools. This can cause massive disruptions to normal functions of the school as well as to learning. It is clear that when mathematics learning is disrupted for students, it is difficult for them to retain information or to get caught up illustrated by LaMarcus’ suspension. This racism continues possibly because of the reactions to these slurs by administrators and others in charge. Instead of addressing the root of the problem, namely individual and systemic racism and how it functions,
these actions are often viewed as isolated incidents. Using racial slurs is a behavior that students “need to knock off” or something that “won’t be tolerated.” But there is little to no work being done in schools to address the endemicity of racism. This is seen in the stories of Jamal’s school’s response to the violent “race war” at his school and in the ways that teachers and administrators react to racism as in LaMarcus and Zahara’s examples of the “N word” being used. School officials see that racism lies in isolated individual behaviors that are learned in places other than schools, not in the systems and structures that exist in rural Appalachia.

To combat this racism in schools, Black students must navigate their surroundings delicately and with an eye toward self-preservation. This robs them of their full humanity and socializes them to believe that they are not allowed to be their full selves. Thus, their academic and mathematics identities are affected; however, this socialization occurs differently in different communities depending on the way Whiteness functions in the specific context. In schools and communities that are predominantly White, Black students must often stay quiet in their classes and avoid disruptions. As Terrell states, “I feel like there’s already a stereotype on you as soon as you walk in, so you don’t even wanna make it worse.” In her mostly White community, Letitia feels “awkward” being the only Black person. But she also must remain quiet about issues of race and cannot talk about her culture: “I don’t think I’d do it (talk about being Black) around them. I just feel like they would say something because they’re real country. And I feel like some of them are racist.” While this quietness is an attempt to avoid racism and to fit in mostly White spaces, they never truly feel like they belong. Terrell grew up in a rural community with White friends, but now he does not feel as though he completely fits in with the White students at his school. Referring to the Black students in his school he says, “We just like kinda stick together more than I would with anyone else.”
While these attempts to blend in occur in mostly White spaces, it can occur in more diverse settings too as exhibited by Jamal. The racial violence in his school was so extreme that he had to stay quiet and even miss school in order to maintain his safety. This silencing continues today as he does not want race discussed at all in his school or classes as it might “trigger the people that are racist.” This White backlash towards issues of race is found in schools and communities with higher proportions of Black people in the region. This is because Whiteness is normal in rural Appalachia, and property is precious in the economically distressed region. Thus, people in these students’ communities cling to their Whiteness in order to maintain this most valuable form of property. They do not see White privilege as existing, so there is no space to allow for Black people to thrive when they make up a significant portion of the population.

Because of this, at times Black students must confront racism head-on in these places. LaMarcus talks about all of the conversations he has with White people about racism: “There’s been like so many conversations dealing with the ‘N word’ … they give off so many reasons and you just try to tell them like ‘please don’t say the word around me.’” Zahara and Yara often argue with those closest to them about issues of race. Zahara says:

We would argue about it (police brutality and racism) and stuff, but I don’t know if she was understanding what we were saying. We wouldn’t stop arguing. I don’t know if she thought we weren’t gonna say anything. We still talk, but we argue all the time.”

These examples highlight the power of Whiteness in the region and its amorphous nature that allows it to thrive. These effects of racism are major socialization factors for the students and impact their academic and mathematics identities. The impact of racism can be especially damaging in mathematics classes that require discourse, questioning, and consistent engagement to be successful. Being in mostly White spaces, Black students in rural Appalachia already feel
as though they are being looked at differently without saying anything at all. There are times, though, when Black students use their voices and are unafraid in the face of overwhelming Whiteness. And these moments of defiance are powerful and need to be highlighted.

Black students’ racialized identities are also formed through their resistance to racism in their schools and communities. Even though LaMarcus feels like he must explain the impact of racism and issues such as police brutality, he continues to talk with his White classmates and teachers because he believes it is necessary. He doesn’t consider himself “political,” but he does not want to stop the fight. Letitia’s academic and mathematical success are forms of resistance which allow her to succeed and set her apart from her classmates. Jamal resists through being a leader on his football team and bringing people together. Terrell and his brother protested racist policies at their school, illuminating the racism at play in their school and community. Zahara and Yara resist racism through the formation of diverse social networks in school and community that allow them to follow their academic paths freely. Learning mathematics is a racialized experience, so Black students’ identities and socialization are directly and indirectly affected by these macro- and meso-level influences (Martin et al., 2017). Next, I discuss the way that micro-level interactions in mathematics classes are also factors in the students’ identity development.

**Micro-level Influences**

The temporality of the students’ experiences highlights the individual experiences that illuminate how they are socialized into mathematics education over time. Across these Black students’ counterstories, elementary school is seen as a time when mathematics is supposed to be more “fun,” particularly because it is based around competition. Students learn early that mathematics education is based around performing operations faster and faster with accuracy
through games and contests. Some students thrive in this environment and enjoy being in competition with others. These students, like Jamal and Terrell, compare mathematics education to their athletic experiences that they love. Other students learned that in order to achieve they must lean into the competition, working to outdo their classmates, like Letitia. Still more are turned off of mathematics altogether at a young age, fearing the embarrassment of needing to solve problems publicly and with speed, like LaMarcus. While there are many authentic learning experiences in elementary school, mathematics is viewed by students as less serious and more fun.

There seems to be a change in students’ perceptions of mathematics when they enter middle school. Many of the students note that middle school mathematics became much more serious. That it was time to “buckle down” and that what they learned in middle school was the foundation for success in mathematics later. Students believed that their trajectory toward college and a career began with achieving in middle school mathematics. This feeling intersected with changes in adolescence, noted by Terrell, and also with the education system in general. Tracking became more common in middle school. A key part of Jamal’s experience was he and his classmates being sorted by tiers in middle school. He was not allowed to reach the highest tier which caused him to de-identify with mathematics. LaMarcus’ experience was shaped by his transition into a remedial class in middle school. The move to this class shaped all of his future mathematics experiences, causing him to develop a positive mathematics identity while still feeling as though he never learned enough to perform well on standardized tests. Middle school is when Zahara and Yara formed their friend group which has been a major socialization factor in their experiences. And Letitia developed a positive mathematics identity through an online
learning platform. All of these are racialized experiences that are impacted by their race and place overtly and less clearly.

Once students got to high school, their identification with mathematics education changed again. The high stakes nature of the subject was amplified by them being one step away from post-secondary experiences. This is particularly true because the education system places maximum value on mathematics education. Because of the perceived inherent value of mathematics education, students often find the subject very important to learn. They view it as necessary in order to obtain their goals of attending college, gaining scholarships, and getting jobs that make them money. Their ideals about mathematics education align with the neoliberal principles of achievement, individual success, and hard work. However, these students’ descriptions of mathematics often contradict the importance they place on it. They question why they need to learn many of the topics that are viewed as essential to high school mathematics curriculum. Letitia says, “High school now has a lot of stuff that’s unnecessary for you to learn. You just have to take it because you can’t graduate without it.” They wonder why they must cover so much and so quickly aside from the preparation that it provides for standardized college entrance exams. Yara explains, “I can’t see myself using trigonometry or anything in life. Or like not on the SAT and ACT.” Even when they identify positively with mathematics as Letitia and Yara do, they do not enjoy it and view it only as a means to an end.

The shift in “seriousness” of mathematics education seems to coincide with changes in instructional methods when students enter middle and high school. Middle school is when students are socialized in and made aware of the linear way in which mathematics is taught. Beginning with algebra, a seemingly foreign concept to the students, ideas build on one another. But students are not encouraged to make connections or to see the interrelatedness of
mathematics topics, instead learning each concept in isolation. Thus, if students do not completely grasp something, then they are lost moving forward and often left behind. This also causes students to rely on their memory to regurgitate facts and procedural methods for solving problems, and they often dislike this, or they at least see it as not very useful. The association that students make with middle and high school math is with “paper and pencil.” LaMarcus sees mathematics education as keeping up with paperwork. Jamal talks about knowing that his teacher can solve problems but not feeling good about his own ability because all the teacher did was do his own work on the board. All students mention the need for memorization and the frustration that comes along with it. Many students do not feel as though secondary mathematics has improved their critical thinking or problem-solving skills which is often cited as a goal of mathematics education only citing brief examples such as the number sense experience for Jamal and two-column proofs for Zahara.

While this linear way of teaching and learning causes students to de-identify with mathematics and to enjoy it less, these students all continue to value their mathematics education, and they want to achieve highly. They have been raised in communities in which economic issues are prevalent, and education is seen as a way to make money and to become successful. In their view, mathematics education is the highly privileged field which can help them the most. This aligns with the neoliberal and neoconservative ideals about STEM and mathematics education. These fields are economic forces that lead to wealth and power for a very few (Martin, 2013). Thus, achievement in mathematics is viewed as the most elite of successes. And this is embedded in all students’ experiences, particularly Black students,’ in a locale such as rural Appalachia. These students often feel connected to their communities, but they also feel the need to get out, to get good jobs, and to find more diversity. The lack of
diversity and opportunity in many Appalachian communities make the desire to achieve stronger for Black students. They often want to achieve so that they can “become to remain” (Wright, 2012) and leave for higher education while still caring for their communities. They view mathematics as a way to do these things. So even though they do not like the over-seriousness of secondary mathematics education and the way that it is taught, they believe that success in it is necessary to reach their goals.

As mathematics is so important to them, students are socialized to believe that the way to success in mathematics education is through a narrow definition of achievement on standardized tests including the SAT and ACT. In fact, preparation for these college entrance exams seems to be the ultimate goal of mathematics for students. For example, while he felt good about his own mathematics ability, LaMarcus had a negative perception of his ability in school mathematics because he didn’t feel as though he had seen enough mathematics to do well on the ACT. Yara explains the privileged status of mathematics and why testing is so important in mathematics: “I feel like math and science—people think are more important than English and social studies. When you get to the SAT and the ACT … English doesn’t matter as much I feel like.” But this narrow view of mathematics and achievement does not align with how students describe their enjoyment of mathematics. Students discuss finding joy in mathematics when it is taught for understanding as opposed to being taught as a series of procedural facts to prepare for a test. They express excitement, joy, and pride when they are able to understand concepts, to make connections, and to solve problems using these understandings. As Letitia states, “I’m like, ‘Okay I understand this.’ It makes me feel like ‘I like this!’” They also enjoy mathematics classes when they collaborate and learn in community with classmates. They love being able to help others to learn mathematics and to discuss mathematical ideas with their peers. These are
things that are very difficult to do in mathematics education when the focus is only on covering material, learning how to copy procedures, and preparing for college entrance exams. Because students’ mathematics socialization experiences are so limited, they end up becoming “satisficers” (Larnell, 2016) whose mathematics identities are limited and who do just enough to achieve so that they can enter college and leave mathematics behind.

**Conclusion**

Racism, anti-Blackness, and White supremacy are centerpieces of our society and education system. This is true in a unique way in rural Appalachia. Whiteness attempts to retain its stronghold in a particular way because Appalachians have been the victim of economic and social exploitation. This has lasting ramifications for Black people in West Virginia and for their experiences in schools and with mathematics education. Mathematics education reifies Whiteness and White supremacy by leaning into the ideas of a meritocracy and individualism that is the foundation of American capitalism. This plays into the way that mathematics is taught and learned by students and limits the possible mathematics identities and socialization experiences for students. There is a focus on memorization, procedural knowledge, and exposure to vast amounts of problems with the goal of students completing paperwork and doing well on standardized tests. These tests are designed to sort students based on so-called abilities, and they often are discriminatory and favor White test-takers. This all requires Black students, in rural Appalachia and elsewhere, to play the game of mathematics education in a White institutional space in order to pursue the future that they envision for themselves. They do all of this while navigating the anti-Black spaces in which they exist.

I believe this study emphasizes the need to re-imagine mathematics education and to completely re-think the way it is taught in schools. It also calls us to reconsider the ways in
which Black students experience mathematics education and learn mathematics and to lean into the fact that mathematics education is highly contextual. Racism and mathematics education vary from region to region, from state to state, from community to community. And this impacts the racialized way in which students develop mathematics identities. In rural Appalachia, this re-imagining must confront racism head on, to get to the root of the issue, and to be aware of how Whiteness functions in different schools and communities. This will be a challenge as Whiteness continues to strangle education through government with the advent of laws banning the teaching of CRT and racism as well as books that highlight the experiences of minoritized populations. But we must continue on to re-imagine a more human mathematics education, one which allows Black students and all students to be their full human selves. One in which all students can find joy in mathematics. And one in which mathematics is not a means to an end, but a subject to enjoy while students work to achieve their goals rooted in their humanity instead of in capitalism and neoliberalism. This begins by valuing the resources and expertise that Black students bring to the mathematics classroom.

Future work requires individual and systemic work to uncover and dismantle racism and racist policies in rural Appalachia. This involves the interrogation of individual teachers,’ students,’ administrators,’ and district officials’ Whiteness to see how they are reifying White supremacy and racism in education. It also involves the power of student voices, particularly Black students,’ in their own mathematics identity development and socialization and the re-imagination of mathematics education. The re-thinking of mathematics education is also a massive systemic undertaking, and it requires imagination and ingenuity from multiple levels. It also requires individual racial reckoning, in which White educators understand their complicity in these issues. This research focused on Black students’ mathematics identities and socialization
in rural Appalachia calls for coordinated work between students, pre-service teachers and educators, classroom teachers, and administrators at all levels to re-think how we can make a more just mathematics education in all contexts that is rooted in humanity and liberation.
Black Students’ Tensions When Freedom Dreaming About Their Ideal Mathematics Education in Rural Appalachia

Mathematics and mathematics education are inherently human. The field of mathematics was created by humans to make sense of the world around (and above) us. Mathematics education involves human interaction, cooperation, and collaboration. However, past movements in mathematics education have had de-humanizing effects on its stakeholders, in particular Black students and other students of color (Martin, 2019). Mathematics is now viewed as universal and objective, but what this really means is it is based on one way of doing mathematics that is rooted in Whiteness. Success in mathematics has been defined by achievement on standardized tests and a narrow view of what it means to do mathematics (Martin, 2019). While many individual schools and classrooms push against this, mathematics education as a whole has lost its humanity. Students are expected to perform procedures quickly using specific algorithms from an early age. The youngest students are sorted based on this and their so-called “abilities,” and this has a lasting impact on students. Mathematics education policy has contributed to this de-humanization through efforts at standardization. Throughout the twentieth and twenty-first century, there has been a push to streamline the mathematics curriculum, many times through the National Council for Teachers of Mathematics (NCTM). In 1989, NCTM published the Curriculum and Evaluation Standards for School Mathematics followed by the Principles and Standards for School Mathematics in 2000. This movement has culminated in the largest standardization of the curriculum, the Common Core State Standards for Mathematics (CCSSO, 2010) that have been adopted in some form in a majority of states. These standards and objectives are usually accompanied by some sort of standardized assessment to hold students and teachers accountable, emboldened by the No Child Left Behind act enacted in George W. Bush’s
presidency. All of these efforts have led to the de-humanization of mathematics education by attempts at making learning mathematics more “scientific” or “foolproof.”

Mathematics education needs a re-imagining and re-purposing towards a more humanizing field. As Su (2020) states, mathematics education and its curriculum have long been a part of the political fabric of American society. It has served neoliberal ideals about individualism, achievement, accountability, and standardization (Hursh, 2007; Martin, 2013). However, there is an increasing call for a humanization of mathematics and mathematics education in order to give students space to become their full human selves. Su (2020) describes this human flourishing as follows:

A wholeness—of being and doing, of realizing one’s potential and helping others to do the same, of acting with honor and treating others with dignity, of living with integrity even in challenging circumstances. It is not the same as happiness, and it is not just a state of mind. The well-lived life is a life of human flourishing (p. 10)

Mathematics education in its current state does not allow for human flourishing. In this piece, I aim to uncover what a mathematics for human flourishing may look like through the imaginations and freedom dreams of Black students about what an ideal mathematics education would be for them in the specific context of rural Appalachia. I also explore the tensions that are present when these imaginations are constrained by the current state of mathematics education.

**Whiteness and Anti-Blackness in Mathematics Education**

Attempts at reform in mathematics education have fallen short in humanizing the field of as they have reified that the field that is a White institutional space that is rooted in anti-Blackness. These movements have attempted to “change” mathematics education while still operating under the dominant forces in the field. To truly address inequities and injustice in
mathematics education, it is necessary to challenge mathematics education as a whole and to imagine what it could be without the constraints of being a White institutional space (Bullock, 2019). It is essential to move in this direction as the aims and practices of mathematics education have been shaped by the racial reality of society which is inherently anti-Black. A White institutional space is characterized by overwhelming control of positions of power and decision-making by White people and White and European thinking as well as a presumed neutrality of the field (Martin, 2013). As Gutiérrez (2017) states, mathematics is viewed as pure and Whiteness defines who created mathematics, who is good at it, and who gets access to it. Battey and Leyva (2016) built on Martin’s and other’s work on White institutional spaces to create a framework for understanding Whiteness in mathematics education which includes institutional, labor, and identity dimensions. Because of the pervasiveness of Whiteness in the field, Black students and other students of color face barriers to mathematical success based on historical and curricular aspects of mathematics education. They also are burdened by unnecessary mental and emotional labor because of the racism that exists in mathematics education. Race also has a bearing on the way students identify with mathematics and mathematical success (Battey & Leyva, 2016).

Whiteness is rooted in anti-Blackness, but anti-Blackness is not the same as racism. Anti-Blackness is the “antagonistic relationship between Blackness and (the possibility) of humanity” (Dumas & Ross, 2016, p. 429). This anti-Blackness has allowed reform movements, such as equity discourse, to take hold and actually reify anti-Blackness. As Martin (2019) says, “The incremental success of reform efforts have historically been offered to Black people as a substitute for liberation” (p. 472). Because of the prevailing Whiteness and anti-Blackness in mathematics education, we must re-imagine mathematics education completely because anti-
Blackness is inherently de-humanizing and does not give Black people the opportunity to become human (Martin et al., 2019). We must make mathematics a place where students, especially Black students who have long been de-humanized in this space, to become their fully human selves. A place where humans can flourish without the constraints of Whiteness and anti-Blackness that exist today.

**Attempts at the Humanization of Mathematics Education**

As mentioned above, there have been efforts to humanize mathematics education; however, the work has been incremental at best and further adds to the oppressive structures in the field at worst. Following is a discussion of two movements in mathematics education which have sought to ensure the humanity of all students and students of color in particular. They are movements to work towards equity and justice in mathematics education. I discuss some of the work in each realm and the ways in which they each have fallen short.

**Equity in Mathematics Education**

The de-humanization of mathematics education purposely sidesteps political and power issues in mathematics education serving instead as ways to “help” or remediate the “low” performance of poor or Black students on standardized tests (Bullock, 2019). The most widespread attempt at acknowledging the failure of mathematics education as a whole in educating a vast number of students is a focus on equity. In theory, it seems, equity is the ideal with everyone getting an equal opportunity for success in mathematics and every student receiving the support they need given their circumstances. In practice, though, this has not come to fruition. Much of this has to do with the dominant discourse surrounding equity in mathematics education. Equity work and discussions often focus on traditional notions of achievement (e.g., grades, standardized test scores) and access to high quality mathematics. As
Gutiérrez (2012) states, this only addresses true equity partially. In her equity framework, these aspects make up the dominant axis, but they fail to address the critical axis of equity that consists of power and identity issues (Gutiérrez, 2012). Current notions of equity are generally uncritical and avoid human and social issues. They seek to maintain the status quo in mathematics education, failing to rethink the field especially for Black students. This allows mathematics education to remain as a White institutional space into which Black students are “invited” (Bullock, 2019).

**Teaching Mathematics for Social Justice**

TMfSJ has attempted to challenge this dominant view of equity and to provide more humanity to mathematics education. TMfSJ involves “reading and writing the world with mathematics” (Gutstein, 2006). Much of the work in classrooms that incorporate TMfSJ aim to fit social justice lessons within existing views of achievement and access using standards-based curricula in algebra, geometry, and probability/statistics (Brantlinger, 2013; Gutstein, 2003; Rubel et al., 2016). There have been humanizing effects including helping students develop a critical consciousness (Gutstein, 2003), an understanding of inequities based on space and place (Rubel et al., 2016), and a power to use mathematics to understand racism (Brantlinger, 2013). Even with these positive outcomes, these highlight the perceived need to adapt social justice issues to the existing dominant view of mathematics as something to be “achieved.” TMfSJ is a step forward, but as Patel (2016) states, “Social justice has become another part of the colonial structure that suffocates exploration and imagination beyond logics of individuals, land property, and decontextualized knowledge” (p. 98). It has fallen short in a full humanization of mathematics education.
Freedom Dreaming in Rural Appalachia

In order to make mathematics education truly equitable and human, particularly for Black students, and to make it an instrument for social justice, we need to begin truly re-imagining what it can be. Freedom dreams are imaginations that are focused on challenging injustices in education and society (Love, 2019). They “interrogate what is ‘normal’” (Kelley, 2003, p. 5). They imagine what is beyond the status quo and the normality that is rooted in Whiteness and White supremacy, especially in American society. Freedom dreams are, however, grounded in reality. They are not “whimsical, unattainable daydreams, they are critical and imaginative dreams of collective resistance” (Love, 2019, p. 101). Freedom dreams also draw on surrealism, imagining beyond what is currently in place (Kelley, 2003). This is especially important in mathematics education. The de-humanization of the educational system, in particular mathematics education, is so embedded in the field that to change it requires imaginative resistance to the oppressive structures that exist including standardized achievement tests and fact-learning, linear teaching based on memorization and procedures.

It also requires imagination about how Black students can exist in mathematics classrooms. Black students have long experienced various forms of violence in their participation in mathematics education. They have been invited to the space, but only if they apply to the norms of mainstream mathematics education (Martin, et al., 2019). Freedom dreaming can move towards a Black Liberatory Mathematics (Martin et al., 2019) education that moves away from the notions of access, equity, and inclusion which often fall short. This is a way to re-think mathematics in a way that values and honors Black students, their families, their communities, and their cultures (Martin et al., 2019). This can be especially powerful in rural Appalachia. As hooks (2009) states, there are competing cultures in the region: “the world of mainstream white
supremacist capitalist power and the world of defiant anarchy that championed freedom for everyone” (p. 11). The goal of these freedom dreams is to tap into the second culture that is found in so many communities across Appalachia and to upend the first dominant culture. This can have an impact not only on communities, but it can build mathematics communities which Appalachian people and Black people have so often been left out of. This re-imagination seeks to honor and value the communities, small or large, and the wealth that they possess while also transforming them from White-dominated spaces. Rural Appalachians, and particularly Black Appalachians, face health, environmental, educational, and other issues imposed on them by a White capitalistic society. A new mathematics education can work to dismantle the structures that cause these disparities.

Rural Appalachia is also a space where freedom dreaming can be impactful because there is a strong sense of community which often binds its people to the place. Education has a strong influence on the ties that Appalachians feel to their communities. Outmigration of young people has become a norm in Appalachia, but this is not because they generally want to leave. Wright (2012) found that Appalachian students often seek an education outside their home communities in order to return and do transformative work in the rural places their families live and to which they have connections. A study of rural students found that students in rural schools are sorted based on ability, and those who are labeled as high achievers tend to be the most likely to leave their communities and not return (Petrin et al., 2014). Students who succeed in school have been socialized to leave for greater opportunity, even when they feel a strong sense of place in their community. These ties to community and place make freedom dreams even more appropriate for these students.
Study Motivation

In order to work towards moving past these notions of equity and TMfSJ, I worked with six Black high school students attending school in various communities across West Virginia. As members of a science and mathematics after-school program, the students have conducted yearly community-based research projects that bind them to their communities. Working in groups, students have identified issues that are immediate to them and their spaces and have planned and executed research to address these with the hope of enacting change in policy or otherwise. Students collect prevalence data, organize educational interventions, or conduct experiments depending on the topic of their choosing.

Through the program, students have conducted research projects that have had great impacts on their distinctly Appalachian communities. They have addressed issues such as mental health, drug addiction, and disease prevalence and disparities in different communities. They have done environmental studies related to water quality, deforestation, and mining. They have tackled social issues such as racism, bullying, and sexism. A few projects stand out for their lasting impact as well as their service to communities of color. In one county known for its high rate of prescription drug abuse, students researched and found out that people in their community were afraid to participate in prescription drug drop offs because they occurred at the county sheriff’s office. They did not want to be seen at the “police station,” so they avoided it leading to further prescription drug abuse. After this finding, the students’ organized drive-thru drug drop-off days as safe places for community members to dispose of their unused prescription drugs. Students compared the amount of prescription drugs collected at their sites to the amount at the sheriff’s office, and this has become an ongoing community activity over the years.
Many Appalachians and people of color in the region live in communities that are unsafe for many reasons. One community with a large proportion of Black people has a high prevalence of life-threatening cancers in its people. There have been studies that have suggested that the water from a nearby creek had been polluted by a power plant. A student did water quality tests and brought the issue to the forefront of local and state media. In a high school in which Black students had experienced racial violence, students created educational videos about micro-aggressions to address racial injustice from students and teachers. They shared these with faculty and their classmates to bring the issue of racism into the consciousness of the school. Because of their experience with these projects, students have experience thinking critically and with a focus on their communities. This work aims to draw on their work in communities and in addressing injustices around them to dream about and re-imagine mathematics education.

My initial aim for this study was to tap into the participants’ experiences in conducting community-based research to develop features for a re-imagined, liberatory mathematics for human flourishing based in critical mathematics (CM) and critical place-based pedagogy (Gruenewald, 2003). I wanted students to imagine how we could develop the conscientization, or political awareness of how oneself is situated in power structures and how politics operate in a specific context (Freire, 1968). CM calls for mathematics education to include “landscapes of investigation” that allow students to explore and make meaning of their world with mathematics (Skovsmose, 2011). A critical pedagogy of place would allow teachers and students to have an impact on the well-being of the specific contexts in which they live and to allow education to service communities and their people rather than current power structures (Greenwood, 2009). This is especially important in a region such as rural Appalachia and for Black students in the context. Shah (2019) wonders if there should be less mathematics education, imagining the broad
range of topics students could study if unburdened with mathematics requirements. He argues that we could have entire courses built around voter suppression, Indigenous people and colonization, and climate change. My goal was for students to freedom dream how this could become the basis for a new mathematics education in which they could become fully human.

As the study progressed, the research aims shifted. Tensions in these freedom dreams surfaced causing a shift in the discussion toward broader ideas about a humanistic mathematics education in this region. So in order to begin to make on a vision for a more human mathematics education for Black students in rural Appalachia, I pursued the following research questions: (1) What do Black students in rural Appalachia think about when freedom dreaming a new mathematics education through the lens of critiques of injustice and community-based solutions? and (2) What do Black students in rural Appalachia consider to be their ideal mathematics education? What tensions exist for students when they freedom dream about this ideal?

**Methods and Data Analysis**

In this piece, I worked with Black students to re-imagine and to freedom dream about a new mathematics education. They do this through the lens of their research projects that involve that involve statistics, mathematics, and science and more broadly to consider what they would want mathematics education to look like. To collect this data, I asked the students multiple questions related to these topics: First, I asked students to consider how their work in communities and with community-based research could be applied to mathematics classes. Students were also presented with lessons based around TMfSJ, and they were asked to critique them and to imagine how they could be applied to rural Appalachia and their own mathematics classrooms. I then asked them to describe their ideal mathematics education. Lastly, students
were asked what they would want mathematics teachers to know about teaching Black students in rural Appalachia.

Analysis involved multiple stages. During the first stage, I looked for specific examples of students re-thinking or re-imagining mathematics education. These instances were noted by their difference from their current experiences. This first stage allowed me to find instances of their freedom dreams throughout their entire interviews. The next stage involved narrowing the codes based on responses that were related to CM and/or community-based mathematics. During this refinement, further codes emerged based on the constraints and tensions that were present in students’ responses through the critical and community-based lens. This analysis involved identifying freedom dreams about their ideal mathematics education, and then coding data that pulled their dreams towards de-humanizing aspects that are currently present. These codes were related to tensions pertaining to traditional notions of achievement and race/anti-Blackness.

Findings were organized around the research questions and these themes highlighting the conflicts that students exhibited while freedom dreaming. I again conducted member-checking (Creswell & Miller, 2000) to allow the students to review their responses and freedom dreams. All quotations in the findings that follow are the voices of the student participants in this study.

**Findings**

Here I present findings focused on the research questions for this study. While my initial goal was to develop features of a more human critical and community-based mathematics education, the tensions between students’ freedom dreams and the embedded systems in mathematics education became prominent. I organize these findings by first addressing the first research question about students’ freedom dreams about a critical and community-based mathematics. While they were able to consider this somewhat, presumably because of their
experiences in the after-school program, they could not fully conceive how these principles could be applied to their classroom. Next, I highlight the tensions that these students felt when freedom dreaming about their ideal mathematics education. First, students’ dreams seemed to be pulled towards ensuring traditional notions of achievement and grading were still a part of their learning. They also were pulled between the idea of colorblindness and colorblind racism and race-affirming practices.

“I just don’t see a math class making a big difference in my community”

Students’ freedom dreams seem to be constrained by many factors in their lives, in mathematics education, and in society and their context. The initial aim of the research was for students to re-imagine mathematics through their work in critical, community-based research and how this could be applied to their mathematics classrooms, students had difficulty in imagining how this could occur and provided only cursory examples. While students were open to this idea, they acknowledged the major difficulties in doing so. Jamal says he sees his research projects as a form of freedom dreaming; however, he does not see really a place for these concepts in current mathematics education. He says, “I feel like it would be too difficult and kinda complex in a sense” citing the vast amounts of assignments that are necessary. LaMarcus also expresses skepticism at this idea. While he sees the value in his research projects, bringing them into a mathematics classroom would not have much of an impact in his opinion. He says, “I don’t think math could really help the community. I just don’t see a math class making a big difference in my community.” Other students see the application of statistics being a way that they could incorporate critical and community-based issues in their mathematics classrooms.

Letitia says that research could be a way to bring ideas about their community into mathematics. She says, “You know, statistics involves math. You can make problems out of
them and that can be a way to get people to do math while also thinking about the question.”

Terrell expressed similar views about the power of statistics and numbers in being a way to do this:

I like the facts. I like when someone tells me something and a reason behind it. Like I want it to be proven to me. Definitely using numbers would help show people, “It doesn’t matter what you think this is the right answer. This is what it is.” I definitely think that we can use math to help solve some stuff in our lives today.

However, all of the students’ dreams are constrained by the current structures in mathematics education. They believe that any ideas about community-based or critical mathematics must fit within the current system, namely achievement and standardization. This is summed up by Zahara who says, “I think it’s interesting to see like the statistics because we usually do surveys. We have to learn about statistics anyways so it would be cool to bring in other things that matter and learn them together.” Students were only able to briefly consider how critical and community-based mathematics could be a part of their mathematics classes. “It would be cool, but it would be really difficult,” says Jamal.

Students’ freedom dreams only briefly focused on making mathematics education critical and community-based. Instead, the constraints they felt revealed tensions that the students experience in their mathematics learning and in their imaginations about what mathematics education can be. These tensions were amplified in the students’ freedom dreams about their ideal mathematics education. They were associated with two main things: mathematics/academic achievement and race (in rural Appalachia). These tensions became the bulk of the content of the students’ re-imaginations. Students’ dreams seem to be pulled between a completely re-imagined mathematics education and the status. Their imaginations allowed them to dream about a re-
imaginied mathematics education; however, the tensions and constraints they feel are ever-present. They are able to move their thinking beyond the traditional, oppressive notions of achievement and race, but they are bound by their experiences which keep them from imagining a full, liberatory mathematics education.

“I would like to have a test at the end of each section … just to make sure we’re on track.”

There is tension between students’ ideas of “playing the game” and “changing the game” of mathematics education (Rubel, 2017). These students have achieved some level of academic success, so they have learned ways to perform well in school. But they also are able to think about a more human mathematics education. Students’ freedom dreams re-imagine the way that classroom interactions occur and re-think traditional classroom structures. However, these dreams always have an eye towards traditional achievement through exams, standardized testing, and grades. Jamal wants a more relaxed, chill environment, but his dream focuses on the way that he is assessed in mathematics. He says, “It’d be instead of like tests it would be more like little quizzes. I thought I learned better off of that” comparing his re-imagined assessment style to another one of his classes. This is in line with his performance on tests being a marker for his success in mathematics. Terrell has similar ideas. Although he raises the idea of having no homework with an all-knowing teacher who can help at any time, he also acknowledges the need for achievement measures and assessment, saying:

For me it would be definitely no homework. The teacher is just super involved, like any questions we have she or he it doesn’t matter she just knows like every answer to every question we have. But I would like to have a test at the end of each section so we make sure we know what we’re learning, just to make sure we’re on track. But like no homework, no pressure. It would just be like fun to learn.
While Terrell can imagine a more human mathematics education, he still feels the need to make sure he’s “on track” and does not move beyond a space where traditional assessment is a key aspect of the field.

Letitia mentions a way for students to work consistently with their classmates in groups of two or more. However, this found its way to a discussion of assessment as she imagines that students could complete tests together:

We can have like two people at a table or little area. And they can work together on their stuff and be like partners for the rest of the year. Assigned partners and stuff and they help each other even when they’re doing a test. Because it can be like on paper. And they’re both trying to solve it.

Letitia also wants a re-imagining of grades, but she still sees the need for them. She says, “I would still keep grades, just a different type of grading based on how you understand it. But maybe not like A B C D…” However, Letitia strives greatly for high grades even though it causes her stress and with the acknowledgement that they are not based in how much mathematics she actually understands. She sees grades as a means to an end rather than a marker of what mathematics she knows, saying, “I want to have good grades because I wanted to graduate with honors. I would get stressed out if I got a bad grade. I’ll have like a breakdown.”

Similarly, Yara feels the pressure and de-humanization of grading policies while still seeing value in them. When asked if her re-imagined mathematics education would need grades, she said:

I don’t know because I like that I have good grades. Like it makes me feel good that I’m doing good and stuff. But also, I feel like I stress a lot about my grades. I’m always checking my grades constantly. Constantly.
In contrast to Letitia’s ideas about collective learning, Zahara imagines a freer mathematics education that relies on individuals moving at their own pace in learning. She saw a video about a high school in Canada where “you learned at your own pace.” She said, “There weren’t really grades you just learned what you need to learn, and you just go past it whenever you learn it and just keep going.” She thinks a lot of teachers feel constrained by the curriculum saying, “I think a lot of teachers if they didn’t have a certain curriculum they were supposed to follow that they wouldn’t have tests.” However, she also realized that teachers must prepare them for the ACT and SAT, so although they could learn whatever they could individually, the next teacher would need to “pick up where they left off” and she sees the need for “more review on the last thing before going on to the next thing.” These students have some real imaginings of a mathematics education without some of the de-humanizing aspects currently embedded in the field, but because of their socialization into a standardized education system they are unable to leave behind the traditional tenets of mathematics. They continue to believe mathematics education must be linear, based in procedures rather than understanding, and achievement-based.

“You know, treat me the same, but you know that I’m Black and not White.”

When discussing race in mathematics classrooms, students dreamed about relationships with teachers, peers, and others in their communities that were also more human and just than they currently are. While the students often state that they are treated fairly in their mathematics classrooms, when responding to what they want their teachers to know about teaching Black students mathematics in rural Appalachia they all mentioned they desire some form of being treated “equally.” However, there were also tensions and constraints in this situation. Their dreams of being treated equally are undergirded by the fact that they are truly not being treated as fully human and equally as their White peers. Thus, there is a tension for students associated
with the feelings of wanting to be treated the same as their White peers while also having their race and Blackness affirmed and honored. This is especially important in the mostly White, rural spaces in which these students live and learn.

This is highlighted by Zahara who said, “It would be best for the teacher to treat all of them, every student, the same because if you’re the only Black person you don’t want to feel different more than you already do.” Letitia has similar thoughts as she believes there is an “awkwardness” being a Black person in a mostly White space. However, there are also communities in West Virginia where Black people make up a larger proportion of the population and students. In these settings, students believe it may be better to ignore race in order to avoid anti-Black racism to thrive. For example, Jamal says, “I feel like they (teachers) shouldn’t say that until something happens. I feel like that will trigger the people that are racist, you know what I mean?” LaMarcus who goes to a school with many Black classmates want teachers to consider the language they use. He says:

Be careful on what you consider is a joke and stuff like that. Or like what you hear because a lot of times that could really end up hurtin’ you know, Black kids’ feelings or make him feel like maybe I shouldn’t speak no more in this class and stuff like that. That would probably be it right there.

Jamal recognized this feeling as he “had to be more careful with what I (he) did” in order to not “get judged the wrong way.”

Terrell expresses the desire to be treated equally to his White classmates because he sees that many people doubt Black students’ intelligence and mathematics abilities. He said:

This is echoed by Letitia:
LEARNING MATH WHILE BLACK IN APPALACHIA

I want them to know that you’re not dumb. ‘Cause people have this I guess idea that Black people aren’t smart. And not really nice … or smart. I think people should just ease up on that. And treat everybody the same not any different.

Zahara also noted that teachers do not always have the same expectations for Black students because they believe they are less capable. She said, “Just like believe in them as much as you believe in any other student.” Jamal has seen this play out in another way as he was the only Black student in most of his college preparation and honors classes.

This feeling of wanting to be treated exactly the same contrasts with their desire for their Blackness to be affirmed and to live as their fully human selves. Letitia sums up this tension when discussing the equal treatment of White and Black students in rural Appalachia. She said, “I think (treating everyone the same) that’s different than just like saying you’re the same like treatin’ you White. You know, treat me the same, but you know that I’m Black and not White. And that, this is different.” But this is all contextual, particularly in Appalachia where the economically disadvantaged population at times denies the notion of White privilege. Zahara notes the difference that Black students face in different communities in West Virginia: “I think it would be different if my school was either all-Black, and then I went to school with all White students. I think it’s different.” LaMarcus illustrates this is in his school with a large proportion of Black students. While he does not consider himself an “activist,” he still will say things such as “Black Lives Matter.” But this is met with backlash when his classmates and even teachers will respond with “All Lives Matter” and “they’ll bring up ‘well he had a warrant for arrest’” when referring to George Floyd. As LaMarcus states, he’s “not saying all lives don’t matter,” he just wants his humanity to be affirmed. Terrell expressed his views on and tensions related to attending mostly White schools saying, “I never really thought it was a problem that I was the
only Black kid in my class. But I think like it would just be better if I had more people in there that looked like me.” Anti-Blackness functions differently in different communities, and these students’ freedom dreams highlight this.

Discussion and Implications

Students’ freedom dreams highlight the embeddedness of multiple de-humanizing facets of current mathematics education. The most salient feature of mathematics education for these students is a focus on standardized testing, college entrance exams, traditional and narrow forms of achievement, and an emphasis on grades. Students place high value on success in mathematics, and they see its purpose as preparing them for college entrance exams that determine their future. Thus, they feel high levels of stress and pressure to achieve highly often at the cost of learning mathematics for understanding. Students were able to acknowledge that these foci in mathematics education are limiting, citing the fact that very little that they have learned is important to their lives. They also realize that teachers are hindered by a standards-obsessed mathematics education which does not allow them to teach how and what they would want. However, they also see the current system as meeting their needs in a capitalistic, neoliberal society. Students were able to dream about a mathematics education with no homework, limited testing, and a re-imagined grading system; however, they always felt the pull back to the traditional ideas around achievement and success in mathematics.

This emphasis on achievement occurs concurrently with thinly veiled and overt racism that students experience. This racism is embedded in the education system at-large and in mathematics education specifically. Students understand that mathematics is highly privileged and that success in it provides a sort of property or capital for them. But they also recognize that this is denied to many Black students in their schools. Students mention that they want their
(mostly White) teachers to believe in the mathematical abilities of Black students and to not question their intelligence or to compare them negatively to White students. They often mention that they want their teachers to be colorblind and to not acknowledge their race, but students would not say this without understanding that they are treated unequally and as less than by their teachers. These students need to be treated as fully human and as equal to their White peers, and this should not be questioned. Educators at all levels need to be aware of the impact of their colorblindness and implicit anti-Black racism has on students, particularly in a region such as Appalachia. Students are able to imagine a mathematics education in which their race is affirmed and that they are able to feel fully human alongside their White peers. But they also feel tension as to what it may mean for their race to be fully honored in this place and space. Because of the prevalence of Whiteness and anti-Black racism, this can feel discomforting for students as it may result in racist backlash.

From students’ freedom dreams, it is clear that they are able to imagine a more human and ideal mathematics education for themselves and their classmates; however, their experiences have been affected by deeply ingrained practices and systems that dominate their experiences. Reform movements such as equity work and TMfSJ have made incremental progress towards a more human and equitable mathematics education, but this is not enough to upend the infatuation with achievement and deeply ingrained racism. Instead of small changes, mathematics education is in need of a re-imagining led by students who are most impacted by these constraints. Freedom dreaming is a way to begin and continue this re-imagining. While these students’ freedom dreams are partial, they get at the need for a more human and equitable mathematics education. They also illuminate the barriers to this. By identifying roadblocks and beginning to
imagine a way out of them, freedom dreaming is a powerful tool in a re-imagination of mathematics education.

These freedom dreams point to a need to fully re-imagine mathematics education and what it means to be a Black learner of mathematics. Calabrese Barton and Tan (2020) present a framework of a “rightful presence” for Black students and other students of color to examine schooling. This lens intends to make visible the lives of minoritized populations with an emphasis on true justice and humanization. As Black lives are often invisible in rural Appalachia, it is important to raise their voices and injustices they face. The tenets of rightful presence include: the idea that political struggle is essential in learning; a highlighting justice and injustice issues while imagining a more just future; a shared responsibility between those in power and those not; and a challenge of power and authority (Calabrese Barton & Tan, 2020). This clearly contrasts equity discourses in which minoritized populations are sometimes welcomed to have rights and carry the burden of the injustices they face. The “rightful presence” framework can be an important lens for future freedom dreams.

**Conclusion**

Whiteness and anti-Blackness are at the core of mathematics education in its present state. Freedom dreams are necessary to move beyond these constraints that hinder students’, particularly Black students’, humanity. In this study, Black students were asked to freedom dream about their ideal mathematics education while also drawing on their experiences with critical, community-based research. It is clear the impact that students’ socialization in schools and in mathematics education has instilled in them a need to focus on achievement and assessment and that success in mathematics is a very narrow construct. Black students have been conditioned that there is one way of doing mathematics and achieving mathematical success
which is to perform well on standardized tests and to get good grades. Racism and anti-Blackness are also features that are embedded in their lives and in learning mathematics in amorphous ways. Their experiences point to the need for a complete re-imagining of mathematics education to move away from the de-humanization that is currently occurring. Previous movements to make incremental progress in equity and justice have not been successful. Black students are invited into a White institutional space rather than having a “rightful presence” in which they can be fully human (Calabrese Barton & Tan, 2020).

While these students’ freedom dreams are constrained by systems and previous experiences in oppressive structures and illustrate tensions that exist in their lives and schooling, this freedom dreaming can be an initial step in a re-imagining of mathematics education. As Love (2019) states, “My entire life is possible because dark folx freedom-dreamed. These dreams were filled with joy, resistance, love, and an unwavering imagining of what is possible when dark folx matter and live to thrive rather than to survive” (p. 93). Students who have been socialized to believe that there is only one way to learn and achieve in mathematics education and who have had to navigate being Black in rural Appalachia, freedom dreaming can be an important practice to consider injustices and to start to break down the systems that are oppressive. Freedom dreams can be a way towards progress and re-imagination while still acknowledging the needs of students in the current structure of mathematics education. It is difficult to imagine beyond what is currently the status quo; however, as Kelly (2003) states, freedom dreams allow us to “discover the many different cognitive maps of the future, of the world not yet born” (p. 10). We must continue to tap into the imaginations of Black students to move towards a more human, liberatory mathematics education. Freedom dreams are a way to do this. But they are not simply an academic exercise, they are a call to action, “an injunction, a
proposition, perhaps even a declaration of war” (Kelley, 2003, p. 192). Educators at all levels in rural Appalachia and beyond must heed the dreams and imaginations of their Black students in order to allow them to become their fully human selves. Freedom dreaming is necessary as “the map to a new world is in the imagination” (Kelly, 2003, p. 2).
Coming Into Critical Race Theory: An Autoethnography of a White Appalachian Man

I am a White man in a (mostly) White place. I almost always have been. I am the “norm” (Anglin, 2002). I was born and raised in the Northern Panhandle of West Virginia, and I lived in the college town in which West Virginia’s flagship university resides for almost fifteen years. It is about an hour’s drive from my childhood home. I have barely ever left my bubble of Whiteness. It gives me comfort, safety, and ease with which to live my life. Why would I leave? But over the years I have attempted to break down my bubble (not pop it), to step outside my comfortable position as a White man in a White place. This has been a slow process, sometimes painful, that has made me question my safety. I know that I need to feel unsafe, uncomfortable, and uneasy. I need to think outside myself, to follow my epiphanies that have made me realize that I am complicit in the racist system and that I have been allowed to be because of my position. If you swim in the water, you are bound to get wet. White man in a White place.

I am a proud West Virginian and Appalachian. I have clung to the mountains and to the perceived culture that accompanies this rolling landscape. One of my favorite weeks at my university is “Mountaineer Week” which celebrates “historical” Appalachian culture. There are demonstrations of blacksmithing, carpentry, agriculture, and even moonshine making. I love it all and eat it up, just like the sweet and salty kettle corn they serve. All of this is truly part of some of the culture in Appalachia, but it also covers up other people and cultures that exist here. It makes them invisible. It is a veneer. A celebration of a racial innocence (Smith, 2004) and the Whiteness of it all.

Whiteness is powerful in American society and in rural Appalachia. I have taken it for granted as have so many White people around me. The purpose of this autoethnography is multiple. First, I aim to explore my participation in White supremacy and racism in my past and
present and to chronicle my journey to racial conscious and my drive to do CRT work in mathematics education. I want to disrupt the normality of the White experience in this region. Another purpose is to observe myself and reflect on my position as a White educator and researcher working with Black students as I conduct the above study. I also document pitfalls, missteps, and the like as a White man doing CRT work. I hope to provide an example for other White people who want to address White supremacy and racism, particularly in the Appalachia region. In the following, I discuss notions of Whiteness in Appalachia and the entanglement of CRT and Whiteness. I provide this framing to show my starting place and a place I still occupy more often than I want to admit. My complicity. As an Appalachian, I feel an oppression from “outsiders” and that my normalness in this land is warranted. And I hope to document my journey out of this safety net.

**Whiteness in Rural Appalachia**

Whiteness is an assumption in rural Appalachia, a given that has gained ground with stereotypes of “hillbillies” and “white trash.” Thus, it has often gone unnamed aside from these labels. Smith (2004) believes in a calling out of Whiteness in Appalachia and in an end to the division of scholarly work between class and race. There are implications for being White in Appalachia, and we must attend to them. That is part of what I intend to do here. However, we must also move beyond those essentializations of Whiteness as they lead to theoretical problems as well. Whiteness is at once revered and looked down upon in Appalachia through the class-focused characterizations that pervade the region (Scott, 2009). Both of these opinions of Whiteness serve to maintain the racial status quo in different ways. When Whiteness is valued, it is to frame White laborers as hard-working, salt-of-the-earth folks upon whom our nation was built. This serves to maintain narratives of meritocracy and pulling one’s self up by the
bootstraps. However, when Whiteness is stigmatized through notions of hillbilly mountain folk and poor White trash, Whiteness is re-centered and class oppression is equated to racial violence (Scott, 2009).

I write this not to dwell on the perceptions of Whiteness, but to highlight the normativity of Whiteness, White supremacy, and White privilege in Appalachia. Because this privilege is so enmeshed in our communities and way of life, it is fluid and difficult to define, much like White supremacy at-large (Hayden, 2002). Because of the ordinariness of Whiteness, Appalachians believe that the land belongs to them and that they are the rightful owners. This is made even more pervasive by the aforementioned stereotypes and media portrayals of Appalachians. However, this claim to ownership is a sort of “self-indigenization” in which Appalachians have taken over lands that were taken from original inhabitants (Pearson, 2013). White Appalachians claim a victimization of colonialization from outside entities and corporations. While the exploitation is real, it hides the fact that Appalachians feel as though they belong to the land and others do not. This includes Black people and Indigenous people.

**Critical Race Theory and Whiteness as Property**

Whiteness is normal, yes, especially in Appalachia. We live in a society that is built on White superiority. Whiteness is also a form of property, something that is of great interest in Appalachia. CRT, which this dissertation is framed around, centers race and people of color. In order to track my progression to a dissertation based in CRT, it is necessary to explore how Whiteness plays a role in CRT and how it has been defined. In its earliest form, Whiteness was defined in courts by its oppositeness to Blackness and “others” (Delgado & Stefancic, 2012). And with Whiteness came acceptance in our nation, privileges that the “others” did not get, and a form of property to carry throughout their lives. Even with this, White people often claim reverse
racism when there are attempts at racial justice such as affirmative action. CRT relies on the belief that racism is deeply rooted in our society and has been so since our nation’s founding (Delgado & Stefancic, 2013).

Our nation is built on the notion of property rights (Ladson-Billings & Tate, 1995), and Whiteness is possibly the most powerful form of property that exists and does so for people like me from birth. Property does not necessarily mean tangible resources or land and white privilege does not equate to material possession (Scott, 2009). Harris (1993), in her seminal CRT work, outlines a legal argument for Whiteness as property. Tracing this idea back to slavery, being White was to be assumed to be free. Being White “was the characteristic, the attribute, the property of free human beings” (Harris, 1993, p. 1721). Using the legal definition of property, Harris outlines that being White comes with a right to use Whiteness and to gain enjoyment from it. It also comes with a reputation built on a racial hierarchy with White superiority at the top. White people have the right to exclude other races and anyone perceived to be of another race based on their Whiteness. All of these together combine to show that Whiteness truly is a form of property in American society. Ladson-Billings and Tate (1995) mirror these concepts in their CRT of education. White students have a right to use their Whiteness to perform in the White institutional space of schools. Schools and programs that are deemed non-White have a lesser reputation, including urban schools. And there is definitely a right to exclude, beginning with de jure segregation and now by more covert segregation and tracking (Ladson-Billings & Tate, 1995).

Critical Autoethnography

Autoethnography is an amalgam of ethnography and autobiography and is the study of oneself in a specific culture. It is “cultural analysis through personal narrative” (Boylorn & Orbe,
Autoethnography involves both autobiographical and ethnographic methods and various forms of data. Data for this study includes memory data, self-observational data, and reflective data (Grbich, 2013). Memory data involved recollections from powerful events, or epiphanies, that result from being a part of a culture or from relating to a certain identity (Ellis et al., 2011). I considered my upbringing as a White male in mostly White Appalachia as well as my time as an
educator, a student, and a researcher. Self-observational data stemmed from events as they were occurring and was collected through my research process and interviews as part of this dissertation. Reflective data occurred following various research activities as I progressed.

Data collection involved maintaining a journal which was my main source of data. Sample journal entries are included in Figures 2 and 3. Memory data was collected as a series of stories and highlight epiphanies I had in those moments or now recollecting them (see Figure 2). These are memories of myself as a child, as a teacher, or more recent memories as a doctoral student and researcher. These were collected on demand as they came to me. Self-observational data came in the form descriptions of myself that I developed as I conducted interviews, analyzed data, and wrote (see Figure 3). This data collection occurred directly following interviews as I worked through the two studies above. Reflective data was collected as I thought about my positionality, about students’ stories, and about my interactions with them through this research. I made notes of how I felt as a White male completing this work, particularly as a person of authority. I also reflected on how my perspective changed over the course of this data collection. Data was also collected through conversations with those close to me including family, friends, colleagues, and mentors. These people had insight into my journey to this work and provided a differing perspective.

In order to create the product of this autoethnography, I conducted preliminary data analysis. This was a “process of checking and tracking the data to see what is(was) coming out of it, identifying areas that require(d) follow up and questioning where the information is(was) leading/should lead” me as I continued (Grbich, 2013, p. 21). This data analysis occurred throughout the entire research process of this dissertation. Next, I edited stories from my memories, observations, and reflections. Part of this analysis involved me recognizing certain
events in my life as data, and identifying certain cultural artifacts (e.g., music) that provoked a
certain feeling in me (Weaver-Hightower, 2019). These events and stories are represented in
different fonts depending on the time of my life they depict. The stories are put into conversation
with each other to highlight the purposes of the autoethnography.

Figure 2

Memory Data Related to Country Music and its Place in My Life and in Rural Appalachia

Figure 3

Reflective data collected during research
My Journey

Take all the rope in Texas find a tall oak tree,
Round up all them bad boys hang them high in the street
For all the people to see
That justice is the one thing you should always find
You got to saddle up your boys, you got to draw a hard line
When the gun smoke settles we'll sing a victory tune
And we'll all meet back at the local saloon
We'll raise up our glasses against evil forces singing
Whiskey for my men, beer for my horse (Emerick & Keith, 2002)

Country music has been the soundtrack of my life. Well, that’s not necessarily true. I can still hear the honky tonk sounds of the early 1990s that played in every store and restaurant. But I was raised on different sounds. Classic rock, Motown, the oldies station. But I found my way back to country music in high school, mainly because I was searching for some sort of an identity. I never truly figured out where I fit in at that time. I played sports, but I never really fit in with the “jocks.” I was “smart,” but I did not mesh with my classmates who identified with academics. A friend of mine made me a compact disc mix with new (at the time) country songs, and I was hooked. I was taken back to the songs that I always heard in the grocery store but that were missing from much of my upbringing. This led me to embrace a new faux redneck personality. I wanted a pickup truck, and I wanted to be country.

A major event in the area I grew up in was a giant country music festival. As soon as I turned eighteen, I wanted to go. I ended up working at the concert in order to be able to get in for free. It became a main event of my life, something I looked forward to each year. Over the years,
I can only imagine the number of times that I sang the lyrics above, a song from Toby Keith and Willie Nelson. Never did I consider the imagery that this song evokes. Never did I notice all the performative patriotism that existed all around me in this culture. Never did I realize that there was not a Black person in sight at the country music festival. Looking back, I realize this event was a bastion of Whiteness. A place where a Confederate flag could fly free. A place where we could wear red, white, and blue on Saturday, feigning patriotism while really unwittingly reinforcing White nationalism.

This is not to demonize all country music or all country music artists; however, there is a specific brand of Whiteness that is associated with it. And that has reared its head in the recent past. Race and racism have been brought to the forefront of country music with a popular artist, Morgan Wallen, being recorded using the “N word.” This led to Mickey Guyton, a Black country artist, pointing out the racism that she has faced in the industry. Meanwhile, Morgan Wallen’s sales have risen. He is now touring again after a hiatus, and I see my friends on social media going to his concerts. Not a consequence to be found.

Hearing the song “Beer for My Horses” and reading about the story of a principal who posted these lyrics on social media in Bettina Love’s book *We Want to Do More Than Survive: Abolitionist Teaching and the Pursuit of Educational Freedom* (2019) made me look at my identification with country music in a way that I never would have thought before. I believe it provides a framing for the way I view my relationship to race and racism as a White male in a White place and my journey to CRT. Country music is omnipresent in Appalachia and West Virginia. What does that really mean?

I attended a Catholic grade school in northern West Virginia for eight or nine years. The school housed students in Pre-K through eighth grade. There were very few Black people in my community and even fewer in my school. None. At that time, basketball was the most important
thing in my life. I was pretty good at it, too. My school had a fifth and sixth grade basketball team, and I was asked to play as a fourth grader. I loved everything about it. I was even good enough to be asked to play for a travel basketball team with other players at Catholic schools in the area. We were all White. Not completely surprising considering the racial makeup of northern West Virginia. But it’s not like there were not good Black basketball players in the area. In fact, for some tournaments if we were going to be short on players, we would bring along Kedrian and Dashaun, Black players from a public school to play with us.

Kedrian and Dashaun were great players and were a lot of fun to be around. But it took them a long time to open up to me. They seemed so foreign to me at the time, and I am sure that they felt like outsiders on the team. I became their friend, but there was always a sort of distance between us. We were different. I can remember the weird feeling I felt when my parents dropped them off at their homes in public housing, and my parents awkwardly trying to explain it to me. The only way I can describe it is by knowing that we were not the same. Kedrian, Dashaun, and I continued to play basketball together and against each other through middle school. We maintained our friendly relationship, but never really developed anything beyond that.

Once we entered ninth grade, we became players on rival high school teams. The rivalry was pretty bitter, there was no love lost. Their high school is in a city (in West Virginia terms) and has a high proportion of Black students compared to the rest of West Virginia’s schools. My school was known as the rural or farm school based on the student population. We all know what that means. Kedrian and Dashaun’s team usually came out as winners on the basketball court. When we played at their school and they won, their student body would chant “Start Your Tractors!” mocking our rurality. To combat that, our team used a warmup tape that played all country music rather than the requisite hip hop and rap. We won that game, and it felt like a big moment. It seemed like there was a war of cultures between the two schools. And on that night, we won the battle. These occurrences led me to having negative thoughts about the rival school
and its students. I still liked Kedrian and Dashaun, but I thought of their school as “rough,” and I was so glad that I did not go to school there. I did not realize at the time how much this was rooted in anti-Blackness.

I was driving back home after a conference in Washington, D.C. I had worked for the after-school program for about six months, and this was my first big event with the director of the program. We traveled together, along with her husband, so I was in the back seat. We began to talk about the schools that I would work in through my new position, and the topic turned to my high school’s rival. I shuddered when she mentioned the school, expressing disgust. “I’m not looking forward to working in that school,” I said. She asked why. I do not like the students there, it is rough, not a good school I said repeating all of the lines that I used when I was in high school. They were embedded in my brain.

I could see the surprise in the director’s eyes in the rearview mirror. I had interviewed for the job, and I had checked off all of the boxes for working for the program. I seemingly understood the importance of a program that specifically works with students from poor families and Black students. In fact, I had encouraged my partner to become a teacher in the program because of the nobility of the purpose of the organization. But all along, I had considered the program and me as an employee of it as a “savior” for these populations, not as a partner in addressing inequities as an ally. Even so, I did not view the students at the rival high school as worthy of saving.

Seizing the opportunity to dig into these feelings more, the director of the program asked me why I thought this way. I explained the rivalry and how I just did not really like students from there. She said, “Did you know that school is one where Black students experience some of the worst racism in the state of West Virginia?” I was shocked. They were the ones chanting “Start Your Tractors!” I said that I had no idea. I started to question my viewpoint a little bit. We continued to talk about the operations of the program, and we discussed how students are admitted to the program. She talked about the conflict in some areas over whether Black
students should get in over poor White students. She said something along the lines of, “Black students face a different (and more difficult) experience no matter their economic background from White students.” We talked about the racism that exists in our state.

I was changed. I had never really thought about any of this before that day. I started to reconsider a lot of things from my past. I kept coming back to the way I interacted with Kedrian and Dashaun, what I really thought of them, and why I really hated everything about my rival high school. I was protected by my Whiteness at my school, and the Blackness at the rival school was foreign and scary to me. But I knew I could not admit to being scared, so instead I went with anger, hate. This conversation was a turning point in my life. It occurred prior to the start of my doctoral studies, but it provided a new lens for me to view everything in my work and in my schooling.

I voted for John McCain. When I say that now, I feel sick to my stomach. The year was 2008, and I was voting in my first presidential election. I had lived in my White bubble forever, and I had just recently gone to college in the big university town about an hour from my hometown. I felt like I had spread my wings, but I was still very, very insulated. One of my roommates was my best friend growing up. I saw my other best friend multiple times per week. I was comfortable, so I did what was comfortable.

Throughout George W. Bush’s stint as President of the United States, I was overall pleased. Not that I really understood or had opinions of my own, but all seemed good enough for me. I wasn’t happy when The Chicks criticized Bush. I was patriotic and proud to be an American! Which makes sense as a middle-class White male in a White community. I had conservative views, mainly fiscally (we had enough money), but definitely somewhat socially also. Being raised Catholic, I valued a nuclear family. While I was not outwardly bigoted, I viewed lifestyles different than mine as “weird” or alternative. So when John McCain ran as the Republican presidential candidate, I was all in. He seemed like a good guy, and I figured things
would stay mostly the same. Plus, he had a woman as his running mate, and I thought it would be great to have a woman Vice President. How progressive of me!

While I did not dislike Barack Obama, I did think that he was a little too far to the left for me (I roll my eyes at this now). I felt disgusted at the birther movement, but I am sure that I internalized some of the racism that came out about his campaign. I did not vote for Obama, but I felt like either option was a pretty good choice. On election night, something changed. When President-Elect Obama took the stage that night saying, “YES WE CAN!” I felt a real pride in being American that was different from the fake patriotism I normally felt. I also felt ashamed. How could I have not been a part of the vote to elect the first Black president? When I saw the people in the crowd crying, I cried along with them. I still had not had my reckoning, but something changed. I voted for Obama in 2012.

I remember the moment I found out. I remember the video I saw on Twitter that later became a meme. “We did it Joe,” Madame Vice President Kamala Harris said through the phone. And yes, they did. I shed tears, tears of sheer relief, joy, and pride that Donald Trump had been defeated in the 2020 presidential election. We had gone through the nightmarish four years of the Trump presidency, and I had major fear and anxiety about another four years. This was exacerbated by multiple things. The first, most obvious was the COVID-19 pandemic. I felt relief that we would have competent leadership to get through the pandemic. Another was more personal, the birth of my oldest son. He was born on March 13th, 2020, the day infamously known as the “start” of the pandemic in the United States. While I put him down for bed the night that the election was officially called, I silently sobbed, thankful that we may have a better world to look forward to for him with the Biden/Harris presidency.

And this does not even mention the monumental milestone this election represented: the first Black, female vice president this country had ever elected. It elicited a pride in me similar to the way I felt when I saw Obama on that stage in 2008. It gave me hope. But this time, I realized the historical significance along with the ludicrousness of the milestone. I recognized the lack of
opportunity and oppression that had to occur for the Harris vice presidency to occur in 2020 instead of much, much closer to the beginning of the founding of our nation. I began to think about what this really represented. But I watched on the night of the election announcement as Black women watched Kamala Harris’ speech along with me, and I felt the movement and knew that I wanted to be a part of it. It felt similarly to when I watched President Obama in 2008, but I recognized that I was farther along on my journey to becoming racially conscious.

But I still know I have a long way to go. I have a lot to unlearn. I had much nervousness and anxiety leading up to the election in November of 2020. But really most of the past four years of Trump’s presidency had been just fine for me. I had no rights taken away, I had not lost income, I had my full humanity. I recognized that others had lost these things. I was angered, hurt, and wanted to fight against this, but overall I was good. But the pandemic changed things. I was less good than I was before, and I knew there needed to be a change. One of my mentors talked to me about how this nervous feeling before an election only once every four years was a luxury and a privilege as many people, including Black people, worry about every election all the time in all elected positions. I see why now as there are legislative battles to take away the vote and the humanity of Black people, immigrants, and other minoritized groups. The worry is real for me now, and it took that conversation for me to recognize the effect all of this has on Black people at all times.

On the night that Joe Biden and Kamala Harris were declared winners, I watched Saturday Night Live for the first time in a long time. Dave Chappelle was the host, and his monologue spoke to me then, and it sticks with me today. In his routine, Chappelle talked about survival. He said that White people did not know how to react to the pandemic, they did not have the skills needed. And I knew he was talking to me. This was the first real, lasting hardship I had faced. But Black people have faced this over and over again throughout their whole lives. He also recalls the feeling that he felt on election night in 2016 when Donald Trump won the election. He felt “anguish” and a horrible feeling. And no matter the results of the most recent
election, many Black people still feel that. The pandemic caused me to think that no one really cares about my well-being for the first time ever. Many White Appalachians feel this too. We feel oppressed, forgotten. But Chappelle says that “Black people know how that feels” very well. And he just hates that feeling. This gave me even more perspective on my own place as a White man in Appalachia and the realities of being Black here and across our country.

I attended a grade school with no Black classmates. I attended a junior high with one or two Black classmates. In high school, I attended a school with a student population of 1,300 and less than ten Black students. I entered the state’s flagship university having been around people that look like me my whole life. And honestly, this mostly continued. As a large proportion of students at the school are from the state, the school is a majority White. Not to mention the fact that I went to college with my best friends from my hometown. So I still stayed pretty safe in my bubble. The most branching out that I did came when I entered the education program. I was the only one of my friends who was preparing to be a teacher, so I had to meet new people. But this meant I met other White people from places more rural than me or from a half hour from our college town.

Honestly, I feel like I just assumed that everyone in West Virginia is White. That everyone grew up just like me. I was the norm. I waited eagerly the summer before I began my fieldwork to see which school in the surrounding area that I would be placed. We all openly hoped for schools in the college town so that the travel was not too far, schools being remote in the area and all. I hoped for an even more specific school, Academy High School. It seemed so similar to the high school I attended that I knew I would feel comfortable there. It turns out, that is where I was placed. One of our first assignments after we got our placement was to create a “Context of Education” document. This allowed us to research the community we would be working in, to learn more about the students, and to add some background to our placement. I remember working on this with some friends. One of the prompts asked us to write about the diversity at the schools where we would be working. We all sort of chuckled, acknowledging
“there is none” in any schools in West Virginia. I made up some line about “while there is no racial diversity, there are class differences” blah blah blah. I drew on my own experiences more than anything and knew that there would be very few Black students there, so why mention it? It felt silly to write about it. The real diversity is in the poor and the rich, the haves and the have-nots. This is what defined West Virginia in my mind. My student teaching experiences did not really do much to change my ideas about the diversity at the school.

I ended up being at the school for quite some time. After I graduated, I accepted a teaching position there. I also got a boys’ basketball coaching position. When I started working there, my experiences were much different than what I had expected. I had classes that had two or three (!) Black students in them. I coached Black students. But I was ready for this. I was conditioned to be colorblind. Treat everyone the same. Diversity does not matter if you treat everyone the same. My teaching epitomized equality. I remember very clearly having a class with two young Black boys in it. I really enjoyed these students, Dax and Trey. I remember Trey wore shoes with teddy bear heads on them to every class, and I just loved talking with him. But Trey stopped coming to class. It was like he just disappeared. I never really questioned why or where he was. He suddenly was not on my class list. No longer my concern. Dax came to class pretty consistently, but he slept a lot. I would wake him up and try to get his attention, but he did what he did. He struggled, but I always thought, “He has every opportunity that all the other students have, he’s just choosing not to take it.” Dax started missing class intermittently. Then more consistently. I would ask him where he’s been, but that was about the extent of it. This is exactly what I would do for any student, I told myself. Treat everyone the same. No diversity...

I go back to the car ride back from Washington, D.C. with the director of the after-school program as a turning point for me. “Black students face a different (and more difficult) experience no matter their economic background from White students,” she said. Not only did this get me thinking about my perspective growing up in West Virginia and my views on my rival high school. It also made me think about my own teaching. I began to think critically about race
and my teaching for the first time ever. What did it mean for me to be colorblind? To treat everyone “equally?” How could I not see the uniqueness and seemingly difficult position a Black student must be in to rarely see someone of the same race as them? I started to think about Dax and Trey. If I had not been colorblind, if I had acknowledged their experiences as Black males in a mostly White school, what might have been different? What must it be like for Black students in these schools all across rural Appalachia?

These questions began firing off in my head. And at the perfect time. I began working with large numbers of Black students in my new position. I observed them, talked to them, heard the way they talked about school, saw the way they interacted with other students. I saw them conduct meaningful, community-based research. Found out what was important to them, what their assets were. I loved working with them. And this coincided with the beginning of my doctoral studies. I was immersed in learning about theories of education. I really took to critical theory, reading “Pedagogy of the Oppressed” by Paolo Freire. I learned more about the so-called “achievement gap” between Black students and White students in mathematics education. Then I revised my thinking after reading Rochelle Gutiérrez’s rebuttal (2008) citing the problems with “gap gazing” and reframing this as an “opportunity gap” for Black students. My mind was swirling with ideas and how to “help” Black students from West Virginia. I did not think of it in these terms, but later I realized I was trying to be their White savior.

As I got to know these students, their brilliance, and their unique perspectives, I also began reading about Critical Race Theory (CRT). The first thing that I read was Ladson-Billings’ and Tate’s (1995) “Toward a Critical Race Theory of Education.” I read the words “racism is endemic in American society.” And it hit me. It still hits me. Racism is in the water we all swim in. I thought about past me. If I can have racist tendencies, then anyone can, I thought. Even though being a White man in a White place set me up for this more than I could have ever known. I learned about counterstories. I heard community members across West Virginia arguing against Black students being admitted to the after-school program saying “well their dad
is a teacher” or a lawyer or a doctor. I saw the Whiteness play out all around me. I felt like I saw the world anew. I read about counterstories, and I thought of the power of the voices of the students I work with. This is how I came to CRT. Because of Dax, Trey, the participants in this study, and all the students I have worked with, my director, my mentors, community members who face racism. I am here in unity with them.

**Conclusion**

It has been surreal to see Critical Race Theory dominating news cycles and being used as a boogeyman by so-called conservatives and White supremacists across our nation. When I first encountered the theory and its scholars, something clicked into place for me. Reading CRT literature alongside work on anti-racism and (de)colonization completely changed my worldview as well as my view of my place in rural Appalachia. I began to see the way that White supremacy functions and the absolute pervasiveness of racism, individual and systemic. I also began to see how this all played out in my mostly White spaces, in my bubble. It was shocking to me but not completely surprising. I knew racism existed, but the way that it has infiltrated my life was more than I could have thought, especially as someone with “good intentions.” I was able to begin to think about the “slick” racism that I saw all the time in my small community. The comments I got when I went to a middle school dance with a Black girl. The fear of affirmative action preventing me from getting into a college that I wanted. The flippant use of the N word around me. I should have seen it, but I did not. Now I do. And this is happening all across the country and in different ways in rural Appalachia. I have a definite feeling of guilt, of discomfort. But I have come to realize that this discomfort is completely necessary for any change to occur. Having White people confront this is one of the major challenges in West Virginia and Appalachia. This makes much more difficult to see the recent war on CRT and critical literature.
It is also difficult because I see much work still needs to be done by myself and others. Conducting this research alongside Black students has brought up so many views that are so deeply rooted in me as a lifelong Appalachia that it is a constant process of learning and unlearning. And I realize that I must do this work. One thing that kept coming up was the idea that as someone older and in a position of authority that I know better than these students. I know what they should have done to be more comfortable, more successful in their schooling and in their lives. The students would describe to me instances and critical events from their past that were clearly (to me) rooted in racism. Following their stories, I would ask, “Do you think that had to do with your race?” or something of the sort. Almost always, the student would say they did not think so. This caused me some frustration, and it made me want to scream at times. But I had to remind myself to take a step back, that this is their experience not mine. I am no savior to them; I am simply here for them to help them document their experiences which are vastly different than mine have been. They live in distinctly Appalachia communities in which anti-Black racism and Whiteness function in different ways. They know this better than anyone.

This came up again when I asked them about colorblind racism. Since leaving the classroom, I have wondered what I would do differently now that I know what I know. I always go straight to thinking that I would not be “colorblind.” That I would acknowledge the racial differences and uniqueness that each student brings. So I asked students if they wanted their teachers to be colorblind. Unanimously, they said a resounding “yes.” I was shocked each time. How could they not want their teacher to recognize their race, to acknowledge their unique backgrounds? But I realize that it’s so easy for me to say that, it just seems so simple. But the reality of Black lives in West Virginia and rural Appalachia is so much more complex. For a teacher to acknowledge race means that everyone would know that the student is different, even
though they all know that people look at them differently based on their Blackness. It also may keep the students from flying under the radar, an ability that some students have when there are not many Black students at their school. Or it might cause an onslaught of racist behaviors. If White students know that the teacher is treating Black students “differently,” there may be an increase in outward racist activities. So my position as a White man has never considered these intricacies. I just thought I could walk into a classroom or into a room of White teachers and say, “don’t be colorblind” and that would be that. But these students deserve so much more. An acknowledgement of context, of repercussions, of Whiteness, White supremacy, and more.

This work has also allowed me to speak to Black educators across the state. While there are not many, their presence is powerful and important. I spoke with one who talked to me about the hiring practices for an administrator in their high school. One candidate was someone who has close ties to the Black community in the area. This person served on boards of non-profits and has lived in the part of town where most Black people live. They were more than qualified for the position, and this Black teacher expressed to the administration the need for this type of person to be in a position of power at the school. The Black students (and teachers) needed this person. Ultimately, the administration decided to “go in a different direction.” The teacher said that this signaled to them that a large group of students at the school do not really matter. This made me realize how systemic the racism is. We hire White person after White person to these positions and do not think anything of it. We also never refer to them as White. Whiteness is the norm. But as soon as someone mentions something that would benefit Black students and/or teachers, everyone loses their mind. The Whiteness, the property hold, the power tightens. This is why CRT is essential. This is why this work is needed in rural Appalachia and everywhere.
Conclusion

This dissertation has sought to document the realities of Black students’ lives and experiences learning mathematics in rural Appalachia and to elevate the voices of Black students in the region. This work also illuminates the pervasiveness of Whiteness and anti-Black violence in many forms in various communities across West Virginia. Black lives and voices are often made invisible in West Virginia for a multitude of reasons. Economic issues are prevalent with many citizens living at or near the poverty level, corporations exploiting the people and the land, and few economic opportunities being present. This emphasis on economic disparities allows for racial justice issues to be backgrounded and often ignored. This is another example of White supremacy being the most powerful doctrine nationwide, and despite the presumed “White innocence” in the region, Appalachia is no exception. This dissertation has aimed to bring the voices and experiences of Black students to the forefront, while also exploring the way that Whiteness and anti-Blackness functions in this specific context.

Review of the Three Manuscripts

This exploration took the form of three manuscripts which I summarize here. Together, they describe the experiences of several Black students in West Virginia learning mathematics highlighting their identity development while attending to the intricacies of the various contexts in which they live and learn. These students’ experiences illuminate various de-humanizing aspects of mathematics education, so I also consider a way forward for a mathematics education that is more human through students’ freedom dreams about a future ideal mathematics education for Black students in the region. Finally, I describe my own journey as a White male entering mathematics education research centered on race and Critical Race Theory. Throughout these manuscripts, I have aimed to illustrate the interconnectedness of race, place, and
mathematics education. I particularly explore the way that Whiteness functions and morphs in the rural Appalachian context to maintain power and how this perpetuates anti-Blackness in Appalachian communities, schools, and mathematics classrooms.

Learning Mathematics While Black in Rural Appalachia: Black Students’ Counterstories of Mathematics Identity and Socialization

In the first manuscript, I amplify students’ counterstories based on their mathematics autobiographies and a series of interviews organized around critical events in their lives and mathematical experiences. In each counterstory, the student’s context of learning is highlighted first examining their experiences in their communities and their schools as well as the broader sociopolitical context of the United States. Placing the counterstory in a specific context is essential as this affects every aspect of the students’ schooling and experiences learning mathematics. It also emphasizes the fact that even in mostly White rural Appalachia, the Black experience is not the same from county to county and community to community. There are intricacies based on where students live, who they grew up near, and the people with whom they interact. Not only does the context provide different Black experiences for students, but Blackness itself is vastly different between individuals. Micro-level examinations illustrate the uniqueness of these students and the varied nature and vastness of the Black experience.

LaMarcus and Letitia exemplify these differences as they both live in the same county of West Virginia, Martin County. LaMarcus lives in the side of the county with a relatively large Black population. A seminal moment in his upbringing was when the Wal-Mart in his town closed, forcing him to travel long distances to a grocery store. He describes his community with the word “poverty,” and he mentions that there is not much to do and many of the parks and other recreational opportunities in his town are in disrepair. He also mentions that the students at
schools surrounding his refer to his school as a “Black cloud” because of the high proportion of Black students. Letitia lives on the other side of the county in a mostly White community, one that LaMarcus feels unsafe driving through partially because of the prevalence of Confederate flags that fly there. Because of the differences in their communities and their place in them, LaMarcus and Letitia must navigate their racial experiences in different ways. The different, yet constant, ways that these students must navigate Whiteness and anti-Black racism is seen throughout their counterstories. Terrell and Jamal grew up in White spaces in towns that have relatively large Black populations. Zahara and Yara grew up in a Black neighborhood, but many of their critical experiences are navigating Whiteness among White people. All of these various contexts in a mostly White state and region deeply affect how students live and learn.

While having unique experiences in their various communities, there was some commonality found in the students’ mathematics experiences; however, they developed mathematics identities differently and experienced their socialization in unique ways. The students’ memorable elementary mathematical experiences were all centered around competition, memorization, and performing computations quickly, publicly, and accurately. For some, such as Jamal and Letitia, this was seen as a good thing. They thrived in this environment and developed positive mathematics identities. Jamal was even known as the “numbers guy.” But LaMarcus viewed the competition differently. He avoided situations when he would have to go to the board to solve problems causing him to miss out on opportunities such as after-school programs and 4-H. He developed an aversion to mathematics that stayed with him throughout his schooling.

In middle school, students began to feel the effects of tracking and the “serious” nature of mathematics education. Like the socialization experiences in elementary school, tracking also
impacted students in different ways. Zahara and Yara were tracked into an honors course in which they formed a racially diverse friend group that they kept throughout their high school experiences and affected them positively. Jamal was denied admission into a high school mathematics class, making him believe “math isn’t for me.” In high school, this seriousness turned into even higher stakes with pressures around college entrance exams and standardized tests being omnipresent. This is when mathematics education for all of the students turned to what they refer to as “paper and pencil.” They performed rote procedures over and over rather than learning for understanding, which led to a dislike of the subject for most of the students. Still, they view mathematics and mathematics education as vastly important mainly because of its utility in helping them to get a good job contributing to the neoliberal goals of mathematics education to aid our capitalistic society. Citing this importance, they also felt immense pressure to earn good grades while acknowledging that the grades did not reflect their actual understanding of mathematics. Although they see the value in mathematics education, every student expressed that they do not want to take a mathematics course in postsecondary school. They all were socialized into a narrow view of what it means to do and to be successful in mathematics education which led them to de-identify with the subject.

Black Students’ Tensions While Freedom Dreaming About Their Ideal Mathematics Education

These students’ counterstories illustrate specific de-humanizing aspects of mathematics education that center their experiences around tracking, standardization, performance on tests, grades, and procedure-based instruction. In the second manuscript, I aimed to explore how Black students in this study could re-imagine a more ideal mathematics education through freedom dreams. As these students completed yearly community-based research projects through an after-
school program, I initially asked the students to consider how the principles of these projects could be used in a mathematics classroom to make mathematics education more critical and based in community. Through this discussion, students mentioned that they would really like to see aspects of this in their mathematics classroom, but they also mentioned the difficulty this would bring. Mentioning the need for homework, tests, and attention to standards, the students’ imaginations in this realm were limited.

I then turned to asking students to dream about what their ideal mathematics education would be without the constraints of homework, testing, grading, and other aspects of the subject. Students imagined various ways that a mathematics classroom could be different and more human. Terrell discussed the idea of getting rid of homework while having a teacher for each student. Letitia discussed being able to work with a partner or in a group for all of the activities in a mathematics class. Letitia and Yara both began to re-imagine what grading could look like if it were done differently. But all of these dreams were pulled to toward the very things that have de-humanizing effects on students. Terrell and Letitia both emphasized the need for tests to track their progress. Letitia and Yara could not imagine getting rid of grades completely as earning good grades made them feel proud while also causing them great stress. Zahara imagined a self-paced mathematics education that allowed for individual freedom, but she also wondered how students would transition between grade levels and be at the same endpoint.

Finally, I asked students what they want their teachers to know about teaching Black students mathematics in rural Appalachia. Every student stated that they wanted teachers to treat Black students as equals to their White peers. While they did not explicitly state this, it is clear that these Black students do not feel able to be their full human selves in their mathematics classrooms. For example, Terrell and Zahara mentioned that they do not want their teachers to
view Black students as less capable at achieving in mathematics. These students believe that they and their Black peers are viewed as less than based on their race, and this has a major effect on their humanity in the mathematics classroom and their mathematics learning. At the same time, they want their race and Blackness to be affirmed. As Terrell says, “I know I’m Black,” and Letitia says, “you know I’m Black and not White.” They simply want their mathematics classes to be places in which they feel fully human and affirmed in their Blackness.

**Coming Into Critical Race Theory: An Autoethnography of a White Appalachian Man**

While the first two manuscripts focused on student voice and the experiences of Black students, the third manuscript explored my own journey to this work while exploring how Whiteness functions in rural Appalachia through a critical autoethnography. I grew up in, attended schools in, and taught in almost completely White spaces. Any experiences I had with other Black people were defined by my internal “othering” of them. This even occurred in my own classroom when I was a teacher. Race was invisible to me, I was colorblind. I thought this was the best way to be as a teacher and a person. I realize now that making Whiteness unnamed was purposeful as part of a White supremacist society. This is especially so in rural Appalachia as Whiteness tightens its grip because of the multitude of economic concerns.

As I entered my work for an after-school program that specifically supports Black students, I still fell into many of the traps that Whiteness lays, centering White, economic issues and viewing myself as a “White savior” for these Black students. However, I learned their stories and grew to love them while I learned about Critical Race Theory and other critiques of injustice. This all made race visible to me in a way that it had not in the past. I knew there was power in these students’ voices, and I believe it is essential to elevate their experiences to illuminate the ways that Whiteness and anti-Blackness function in mathematics classrooms. Throughout this
research, I had to continue to interrogate my complicity in anti-Blackness and White supremacy. I still continue to do this as it is a continuous process with no endpoint. My journey is a microcosm for the way Whiteness operates as the norm in this region and how this impacts Black students as the educational workforce is overwhelmingly White. This autoethnography emphasizes the need for White educators to interrogate their own, often subconscious, participation in anti-Black racism and how this can be rectified in schools and society.

**Implications for Theory and Practice**

This research has many theoretical implications and calls for action in practice and further research. First, I believe this study addresses and emphasizes the need to situate mathematics education research in specific contexts (Ladson-Billings, 2005; Martin, 2012). This is especially true of research that is centered on race. The experience of Black students is not monolithic, so it is necessary to attend to the intricacies and realities of their truths when conducting mathematics education research. Attention to context also allows for an interdisciplinary approach to mathematics education research that can explore sociological, political, and historical effects on students’ current experiences in mathematics education. This study’s focus on context allowed for a different perspective on students’ lives and how their broader experiences affect their mathematics learning. Black students in every context must grapple with their race and the perception of others constantly. They are always considering what others are thinking about them because of their race, and this mental load is robbing them of being able to live their full lives. However, this occurs differently in different communities even in rural Appalachia. Attention to context can illuminate the many facets of Black students’ lives in anti-Black spaces that impact them as learners and doers of mathematics.
Along with exploring the sociopolitical, cultural, and historical context of mathematics education, CRT continues to be an essential theoretical lens with which to view the field, particularly exploring the notion of property rights. In a region where property and its ownership are tenuous, this study examines the interrelatedness of property rights, race, and mathematics education. As mathematics and mathematics education are forms of property and capital themselves (Bullock, 2017) and mathematics education serves a neoliberal agenda aiding capitalism and economic forces, this intersection is essential to address. The way in which mathematics education is a market force allows it to remain inequitable and unjust and for the de-humanizing aspects of mathematics education to remain. By focusing on these core features of mathematics education through research, I believe we can disrupt the status quo leading to the possibility of a re-imagining of mathematics education such that the goal is for students to become fully human rather than workers in a capitalistic society.

Again drawing on CRT, I believe mathematics education research must continue to increase attention to Black students’ voices and the voices of other minoritized populations. Counterstories are one way to do this, and student voice must be at the center of future research in mathematics education. Diverse student voices have long been neglected and ignored, and this denies the power that students have to enact change and to be activists. We as mathematics educators and researchers must stand in solidarity with Black students and honor their perspectives and allow them to speak truth to power. By limiting the voices of our students, particularly those so often left out, we ignore rich sources of knowledge and experience. Part of this attention to student voices includes giving them space to freedom dream. While the students’ freedom dreams in this study were constrained by the embeddedness of the achievement and assessment discourses that permeate mathematics education, this was an important first step. As
Love (2019) says, “My entire life is possible because dark folx freedom-dreamed” (p. 93).

Freedom dreams are the root of change, and the more one does it the more possible that radical future becomes. Thus, it is essential to give students, teachers, and other educators space and time to freedom dream and to continue to do so to break down the embedded de-humanizing aspects of mathematics education.

Implications for practice are drawn from this research as well. First and foremost, White teachers must commit to interrogating their Whiteness and their purposeful or unwitting complicity in White supremacy and anti-Blackness in their lives and in mathematics education. Examining myself as a research subject allowed me to see the ease with which anti-Blackness invades our lives, and we do not need to be purposefully or explicitly “racist” in order to do harm to our Black students. This allows for a White innocence to take hold and dominate, perpetuating White supremacy and anti-Blackness (Smith, 2004). This system and society are purposefully designed so that White people do believe in their innocence and that they are not racist. Thus, interrogation of ourselves does not come without a true commitment and determination to make Whiteness visible, and a willingness to affirm others’ race. If this is not present, the normal, invisible Whiteness will continue its hold on our society and schools. Love (2019) states:

Teachers need to be taught how to question Whiteness and White supremacy, how to check and deal with their White emotions of guilt and anger, and how these all impact their classrooms. Only after unpacking and interrogating Whiteness, White teachers—and, really, all teachers—must unpack how Whiteness functions in their lives; then they can stand in solidarity with their students’ communities for social change (p. 75)

This commitment must be especially strong in regions such as rural Appalachia where Whiteness has a stranglehold on the culture because of the foregrounding of economic issues. This must be
done by all teachers as Whiteness functions differently in every community, every school, and without this interrogation no change will occur for Black students. This work is also essential for White students as they will need to resist anti-Blackness around them as well.

Mathematics teachers must also re-consider the way they themselves identify with and view mathematics and mathematics education. We must all think about what we consider to be the purpose of mathematics education. Along with this, teachers must grapple with how they address standards and standardization and whether this is truly benefitting the students in their classrooms. Because of the de-humanizing nature of many grading policies, teachers and administrators must also re-imagine how grading occurs and how to strip it of its high stakes nature which causes great anxiety and stress in many students and causes others to fail to have opportunities to learn. This all must occur together with a re-thinking of instructional practices. It is clear that these students experience very little instruction that is focused on understanding and making connections between mathematical concepts throughout their schooling. Even in elementary school, students are expected to memorize and perform procedures quickly. This is also seen in middle and high school where students talk about learning mathematics only as something that involves using a “paper and pencil.” Mathematics can allow our students to flourish as humans and bring joy to their lives, but to do this, students must have opportunities to truly understand mathematics. This is what allows students to enjoy the subject. As Letitia says, “‘Okay I understand this.’ It makes me feel like ‘I like this!’” We need to provide more opportunities for students to view mathematics in this way.

Future Work

This research leads to a call for further work on race in mathematics education in this region and beyond, something I intend to continue. First, I will continue to be in contact with the
participants in this study to learn more about their experiences in higher education. I also want to learn about their perspective on their K-12 experiences in mathematics education after being removed from it for some time. I also intend to give them more space to freedom dream to imagine their own futures and the future of mathematics education for other Black students. In addition, I plan to learn more about the experiences of Black students in various contexts including in more densely populated areas and rural communities in other areas. I will explore their experiences using various lenses and constructs in order to explore how Black students navigate Whiteness and anti-Blackness in mathematics education. I also plan to use this research and future work to inform an examination of the perspectives of White teachers, administrators, and other educators in rural Appalachian schools and other contexts. It is essential to understand further how Whiteness functions at the micro-level in classrooms and systemically in schools, districts, and communities in order to illuminate the often invisible anti-Black racism in the field and in this context. Both of these areas of research should have in mind a re-imagining of mathematics education to make it more humanizing and affirming for Black students. The current system is rooted in Whiteness, anti-Blackness, and de-humanization and needs re-structured. This requires imagination, coordination, and persistence at many levels.

I believe that mathematics teacher education is a field in which this systemic change can begin to take shape. In the future, I aim to use these areas of research as well as future work on Whiteness and anti-Blackness in mathematics education to form a network of K-12 students, pre-service teachers, practicing teachers, and other educators to re-imagine what mathematics education can be. The voices of all stakeholders are essential to enact true change because it would allow us to acknowledge and address the tensions that each group of stakeholders feels when working towards reform. Just as the students felt tensions when freedom dreaming in the
second manuscript, pre-service teachers, practicing teachers, and administrators are also pulled in
different directions when aiming to enact change. This network may be able to confront these
challenges in order to re-think and design K-12 mathematics classes as well as teacher education
courses, particularly those centered in practice-based teacher education. Pre-service teachers and
practicing educators often understand what they do not want to do in their classrooms, but they
often revert to traditional practices in mathematics education because they are not sure what to
do to ensure equitable and just teaching and learning. I plan to root this work practice-based
teacher education and integrating it with CRT and other critiques of mathematics education so
that educators can have specific practices in this re-imagining of mathematics education. All of
this must be done with attention to context, and Appalachia is an important region to continue
this work.

Closing

As someone who grew up White in rural Appalachia, I understand how easily Black
people’s experiences and perspectives can be ignored in dominant discourses and by other White
people in this region. My hope is that this work elevates the voices of the brilliant minds and
spirits of the students in my study to show that we can no longer ignore the unique and adaptive
racism, individual and systemic, that exists in rural Appalachia. I also hope to show the
pervasiveness of Whiteness of the region and how easy it is to partake in racist activities and
perspectives while making the perspectives of Black people invisible. I believe that LaMarcus
says it best when he said, “These are things that people don’t ask about. People don’t really care
cause there’s not a lot of improvement where I’m from.” If we can believe in the brilliance,
power, and humanity of Black students, particularly in mathematics education, then we can re-
imagine the field and end the violence that Black students face in the classroom. We can
acknowledge the Whiteness, the racism that exists and move away from it. We can acknowledge
the Blackness that exists and honor it. Rural Appalachia and West Virginia have long been
considered neglected and ignored. It is time for that lens to look inward, to make our
communities, our schools, and our mathematics classrooms safe and life-affirming places for
Black students.

they hope

and hope

for change (hooks, 2012, p. 62)
References


Conway, B. M. (2020). Climate change in Alaska. In R. Q. Berry, B. M. Conway, B. R. Lawler, & J. W. Staley (Eds.), High school mathematics lessons to explore, understand, and respond to social injustice (pp. 119-126). Corwin.


Jett, C. C. (2019). “I have the highest GPA, but I can’t be the valedictorian?”: Two black males’ exclusionary valedictory experiences. *Race Ethnicity and Education, 1*–19. 

https://doi.org/10.1080/13613324.2019.1599341


https://doi.org/10.1080/13613320902995491


McGee, E. O., & Martin, D. B. (2011). “You would not believe what I have to go through to prove my intellectual value!” Stereotype management among academically successful black


toward empowering all children with a key to the gate. *The Mathematics Educator, 14*(1), 8-18.


(and mathematically) successful African American male students. *American Educational
Research Journal, 45*(4), 975–1010. [https://doi.org/10.3102/0002831208319723](https://doi.org/10.3102/0002831208319723)

Stinson, D. W. (2011). When the “burden of acting White” is not a burden: School success and

Stinson, D. W. (2013). Negotiating the “white male math myth”: African American male students and
[https://doi.org/10.5951/jresematheduc.44.1.0069](https://doi.org/10.5951/jresematheduc.44.1.0069)

Stinson, D. W., Jett, C. C., Williams, B. A. (2013). Counterstories from mathematically successful
African American male students: Implications for mathematics teachers and teacher educators. In
J. Leonard & D. B. Martin (Eds.), *The brilliance of Black children in mathematics: Beyond the
numbers and toward new discourse* (pp. 221-245). Information Age Publishing.


Press.

Tate, W. F. (1997). Chapter 4: Critical race theory and education: History, theory, and

Thompson, L., & Davis, J. (2013). The meaning high-achieving African-American males in an urban
high school ascribe to mathematics. *The Urban Review, 45*(4), 490-517.
Vergnaud, G. (1988). Multiplicative structures. In J. Hiebert & M. Behr (Eds.), *Number concepts and operations in the middle grades* (pp. 141-161). NCTM.


