African American Male Students' Engagement with Science: Insights from General and Special Education Participants

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Abstract

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This qualitative, narrative study employed dis/ability critical race theory (DisCrit) and Elite Capture to examine the science learning experiences of five African American male high school students, three in general education and two in special education, who participated in a summer sports program in East Brooklyn. The study also incorporated the perspectives of one parent of the special education students and two special education teachers. By focusing on individual narratives, this research aimed to illuminate the challenges and successes these students encountered as they navigated science education across diverse learning environments. Semi-structured interviews and focus groups provided rich insights to address the following key questions: How do African American male high school students, both in general and special education, perceive their science education? What factors shape their engagement and success in science? How do their experiences influence their decisions to pursue science-related fields after high school? The findings revealed that teacher-student relationships, access to engaging and relevant science curricula, and structural inequities significantly shaped students' perceptions and engagement in science education. Systemic barriers, including limited access to advanced science courses and inadequate classroom support for students with special education needs, posed substantial obstacles to success. However, positive influences, such as effective pedagogical practices, supportive teacher-student relationships, and a personal passion for science, emerged as critical factors fostering optimism about STEM careers. This study contributes to broader discussions of equity and inclusion in STEM by addressing systemic biases and stereotypes faced by Black male students, particularly those in special education. It also highlights how these students' science education experiences shape their aspirations and pathways toward future engagement in STEM fields.

Keywords: African American males, science education, equity, inclusion, dis/ability critical race study, elite capture

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Dedication

This dissertation is dedicated to my mother, Elsa Fleming, who is no longer with us. Mommy, without your sacrifices, values, love, and guidance, I would never have reached this point in my educational journey. My hope and belief are that you can see me now and that you are proud of all I’ve accomplished.

To my son, Raquim Spooner, this is for you. As a Black male growing up in America, I hope my work serves as a lesson and a reminder that the color of your skin does not define who or what you become. You can achieve greatness, and I will always be here to remind you of that.

Chapter 1: Introduction

In recent years, the underrepresentation of Black male students in STEM fields has become a growing concern. The *State of U.S. Science and Engineering* (2022) highlights that Black and Hispanic individuals remain underrepresented among those earning science and engineering degrees and within the STEM workforce at the bachelor's level and beyond. This disparity reflects persistent challenges in accessing and advancing in STEM education and careers. While there is limited research on how early science experiences in elementary and middle school influence the interest of Black and Hispanic boys in science during high school, more studies have examined high school experiences and their impact on postsecondary education choices (Hoogstra & Shernoff, 2001; Maltese & Tai, 2011; Wang, 2013).

"Elementary and secondary education in mathematics and science serves as the foundation for pursuing STEM majors and careers" (The State of U.S. Science and Engineering, 2022, p.5). Research has shown that students' success and interest in science during high school play a critical role in their decision to continue studying science in college or other postsecondary pathways (Hoogstra & Shernoff, 2001; Maltese & Tai, 2011; Wang, 2013). Given these findings, examining the high school science experiences of Black boys is essential to identifying factors that may contribute to their underrepresentation in STEM fields.

This study focused on the science experiences of two groups of students commonly found in the U.S. public education system: general and special education students. For this study, I describe the differences between general education and special education within the U.S. public education system, as these terms are referenced throughout this paper. General education students typically do not have learning or physical disabilities that might impede their academic success. They can access educational material without any accommodations or assistance. In contrast, special education students may have physical or mental disabilities requiring additional resources or accommodations to achieve academic success. This study addresses the issue of underrepresentation of minorities in science education, highlighting the importance of STEM education. It also highlights the overrepresentation of minoritized students in special education, suggesting a need for further research and interventions in this area.

First, how is a child in special education described? Under the Individuals with Disabilities Education Act (IDEA) of 2001, a child in special education is typically referred to as a 'child with a disability.' A more detailed breakdown of the disability categories outlined by IDEA can be found in Chapter 5. In the U.S., children (infants, toddlers, children, and youth) with disabilities were not always protected and afforded any rights to ensure they were academically successful. However, in 1975, the Education for All Handicapped Children Act (EHA) changed the narrative. A key objective of the Education for All Handicapped Children Act (EHA) was to ensure that all children with disabilities have access to a free and appropriate public education, with a focus on special education and related services tailored to their individual needs (Individuals with Disabilities Education Act, 2001). This emphasis on individualized education plans and tailored services marked a significant shift in how students with disabilities were supported in the education system.

Another shift was towards changes of names. The title "Education for All Handicapped Children Act" was changed to the "Individuals with Disabilities Education Act" in 1990. According to Devlieger (1999), the historical transition from using the term "disabled" as opposed to "handicapped" was influenced by both social and cultural aspects of society in the United States. Socially, handicapped was and is considered a very harsh and offensive term and has profound implications for the way someone is treated. The use of the term disabled was considered more culturally sensitive, and it also opened a world of new opportunities for people who may fall into this category. Devlieger (1999) argued that prioritizing the individual in the phrase “person with a disability” shifts the focus away from the person as the source of the problem and instead places responsibility on the environment. This perspective suggests that academic challenges should not be attributed to the children themselves but rather to the need for adjustments in their surroundings to support their success.

The Centers for Disease Control and Prevention (2023) describes disability as a physical or mental condition that hinders a person’s ability to perform specific tasks and engage with their environment. Understanding the prevalence of disabilities, particularly among minoritized children, provides an important context for examining special education demographics. Losen and Orfield (2002) reported that in 1998, around 1.5 million minoritized children were classified as having mental retardation, emotional disturbances, or specific learning disabilities. That same year, the National Center for Education Statistics (1998) reported 46.5 million students enrolled in public elementary and secondary schools across the 50 states and Washington, D.C. These statistics underscore the significant presence of minoritized children in special education programs.

For this study, I will focus on two main disability categories -- intellectual disability and emotional disturbance (discussed in more detail in Chapter 5). These categories were chosen due to the disproportionately high number of minoritized students, particularly Black students, placed in them. This overrepresentation is not incidental but rather a reflection of the historical and ongoing use of special education as a tool for segregation, effectively limiting access to rigorous coursework, resources, and equitable educational opportunities. By examining these classifications, this study aims to highlight the systemic inequities within the educational system and how the labeling of students can serve as a mechanism for exclusion rather than support.

These focus areas highlight the need for equitable educational opportunities and targeted interventions, particularly within STEM fields. To address these issues, the following research questions guided this study.

1.1 My Narrative

I migrated to the United States from Grenada in 2008. As an only child, it was a difficult decision to leave my mother behind, but I was driven by the hope of building a better life. My son was born shortly after, in 2009. At the time, I only held an associate's degree and was an undocumented immigrant working in the service industry as a waitress. I earned just $4.60 an hour and relied heavily on tips to make ends meet. I worked at night and took care of my son during the day. My husband and I became a tag team; he worked during the day while I worked evenings. However, there were many times when our schedules clashed, leaving us without a workable solution. Daycare was not a viable option, not only because of the cost but also because my husband's work hours meant he couldn't pick up our son before closing time. Eventually, we made one of the most complex decisions of our lives: we sent our son back to Grenada to live with my mom. That decision broke my heart, but in hindsight, it was one of the best things we could have done.

In Grenada, my son had access to free schooling, open space to play, and the freedom to be a child. He could run, laugh, and explore without fear of being misinterpreted, stigmatized, or harassed by police. Most importantly, he developed a strong, loving bond with my mother, a bond I will always cherish. He stayed in Grenada for three years, and we brought him back to the U.S. when he was five years old and ready for kindergarten. By then, my husband and I had gained some stability. That same year, we enrolled our son in a charter school, and I enrolled in Brooklyn College to pursue my bachelor's degree in science education.

In my very first science class, I was stunned by the absence of Black students. Out of a class of about 50 to 60 students, only five of us were Black. I initially thought it was an anomaly, but I quickly realized it was a pattern; nearly all of my science classes throughout my bachelor's and master's programs looked the same. This underrepresentation ignited a deep curiosity in me: Why aren't more Black students enrolled in science classes? That question laid the foundation for my research.

However, my study did not focus solely on Black students in science; it also explored the experiences of students in special education. That interest came from a place much closer to home. After three years of early childhood freedom in Grenada, my son entered a radically different world in the charter school system. The rigid, compliance-based culture was a shock to him. Everything from speaking too loudly to slouching or stepping out of line was harshly disciplined. He struggled to adjust. When he expressed himself or resisted silence, he was seen as defiant. He began to react, screaming, running out of the classroom, and shutting down. Instead of being met with understanding, he was labeled. He was placed in special education and given a diagnosis of "emotionally disturbed."

What followed was a nightmare. My son was suspended almost weekly. I developed anxiety every time my phone rang, expecting it to be the school calling with yet another issue. I often had no choice but to bring him with me to my college classes after he was suspended from school. I was embarrassed, and I began to lie about why he wasn't in school. On two separate occasions, when neither my husband nor I could immediately pick him up, the school called an ambulance and had him admitted to a psychiatric unit. I will never forget the pain I felt picking up my child from a mental health ward.

The suspensions and calls from the school went on for years. And because of where we lived, there were no well-rated public schools in our district as alternatives. But as I progressed in my education, learning more about special education law and the Department of Education, I became better equipped to advocate for him. By middle school, I had him re-evaluated and successfully removed from special education services.

The anger, shame, helplessness, and sadness I experienced during those years fueled my research. My son's experience taught me firsthand how Black boys in special education are often misunderstood, mishandled, and misdiagnosed within school systems that do not affirm who they are. His educational journey helped me recognize how special education labels can significantly shape the academic and social experiences of Black students, often placing them on a path that limits rather than supports their potential.

Now, as a high school teacher, I see how the system tracks students, how special education students are systematically excluded from advanced courses like science, and how limited their opportunities are to be challenged or encouraged. I've observed how their trajectories differ dramatically from those of their general education peers and how teacher perceptions and institutional policies exacerbate those disparities.

My dissertation was born out of these personal and professional experiences. It is a reflection of the questions that haunted me as both a mother and an educator: Why are Black boys in special education treated differently? Why are their voices so often silenced? And what can we do to reimagine science education so that it becomes a space of possibility rather than punishment?

1.2 Purpose and Research Questions

My research questions were informed by my child's experiences and my own experiences as a teacher in examining the treatment of minoritized youth in education. I am interested in exploring the relationship between African American boys and their experiences with science learning. My research questions for this study are:

1. How do African American male high school students in general and special education perceive their science education?
2. What factors shape their engagement and success in science?
3. How do these experiences influence their decisions to pursue science-related fields after high school?

These questions were critical for understanding the underrepresentation of African Americans in STEM fields. To address this underrepresentation, educators, parents, stakeholders, and policymakers should be informed about the sentiments of African American male special education students regarding the quality of science education they receive at their school, whether positive or negative. How these students perceive their learning, whether positively or negatively, can significantly impact future pedagogical practices in science education (Akdemir & Gurleyik, 2018; Murcia, 2013).

Science-related activities are another essential aspect that influences students' perception of science. Studies have shown that out-of-classroom science activities can help bridge the academic gap in science and increase the interest of both general and special education students in science (Ade-Ojo et al., 2022; Fisher, 2017; Kleinert et al., 2007). Therefore, do the schools that African American students attend offer extracurricular, science-related activities? And if they do, are students finding them beneficial or enjoyable?

Fostering an interest in science will eventually broaden the participation in science, especially for students in the special education program. This would only work if students in the special education program believe that they belong in science. A sense of belonging can affect whether a student is drawn toward a specific discipline and performs well in it (Betancu et al., 2021; Brooms, 2019). By fostering a sense of community and inclusion through extracurricular activities, students are more likely to feel that they belong in science and, as a result, be motivated to pursue further opportunities in STEM fields.

1.3 Significance and Implications

Research on the science experiences of Black boys is needed to address equity and inclusion in STEM fields. The global economy is shifting towards STEM-focused industries, creating career opportunities and a higher standard of living for all (Atkinson & Mayo, 2010). As a result, policymakers need to ensure that everyone, regardless of race, ability, or gender, has an equal opportunity to participate successfully in this growing field. STEM's role in driving innovation (Benish, 2018; Atkinson & Mayo, 2010) highlights the need to address the underrepresentation of Black and other minoritized groups and to ensure equal opportunities for financial security for all.

Research is also needed on this topic to identify and address any stereotypes and biases that Black special education students in science experience. By being placed in the special education program, Black students often feel like they are not smart enough to excel in subjects such as science and mathematics (Hume et al., 2010). With more research, strategies to counteract any stereotypes and biases can be identified, equipping teachers with the tools to improve their pedagogical practices and create more equitable and inclusive learning environments for Black special education students.

This study's implications highlighted the potential outcomes and impact of its findings. The results can contribute to existing knowledge or theories around this topic and have practical implications, such as recommendations for teacher education and professional development programs. This study may also impact school communities in underserved neighborhoods by potentially offering ways to improve support for minoritized students in special education, thereby enhancing their academic success in science.

1.4 Structure of the Dissertation

The following outlines the structure of this dissertation. In Chapter 2, the literature review provides a foundational background and clarifies relevant information for my study. This chapter begins with a brief history of education in the U.S., tracing its roots back to the era of slavery. The purpose of this historical overview is to highlight how marginalized groups, particularly African Americans, have historically been deprived of educational opportunities and have continually had to fight for access to education. Following this, I provide insight into key terms and concepts in special education that recur throughout the study. This section also includes essential data to contextualize the experiences of Black boys in special education.

Next, I examine the literature on the disproportionate representation of Black boys in special education and its connection to the underrepresentation of Black students in advanced academic opportunities. Building on this, I explore the broader experiences of Black boys in public education, gradually narrowing the focus to their experiences in science education and special education settings. This section discusses strategies for making learning accessible to Black and Brown students, with a particular focus on Black boys. The literature review culminates with an in-depth discussion of the theoretical frameworks guiding this study:

Disability Critical Race Theory (DisCrit) and Elite Capture. These frameworks provide the lens through which I examine my research questions and findings.

The methods section (Chapter 3) follows the literature review. Here, I detail how data was collected, the types of data included, and the processes used for analysis. This narrative qualitative study is supported by a rationale for adopting this approach, emphasizing its appropriateness for the research questions and participant experiences.

The findings are presented in two stand-alone chapters (Chapters 4 and 5). Chapter 4 focuses on the experiences and insights gathered from interviews with boys in general education. Chapter 5 delves into the findings from interviews with boys in the special education program, two special education teachers, and one parent of a special education participant. These chapters provide a nuanced understanding of the participants' experiences.

Finally, the dissertation concludes with a discussion chapter (Chapter 6) that revisits the research questions and considers the findings. This section synthesizes the overall results, addresses the study's limitations, and explores implications for educational practice and policy. This final chapter underscores the significance of the research and outlines directions for future inquiry.

Chapter 2: Literature Review

This literature explores the historical context of education in the United States through the lenses of Disability Critical Race Theory (DisCrit) and Elite Capture. It argues that despite the passage of time, the inequities faced by African Americans in education have remained largely unchanged. Historical patterns of segregation continue to persist, albeit in more subtle forms today. Resources that should be allocated to marginalized groups are still controlled by dominant groups, reinforcing systemic inequality. The review also highlights how special education functions as a modern form of segregation, disproportionately affecting African American students and masking the racial discrimination embedded within the educational system. Overall, it shows that much of what occurred in the past continues to shape the educational experiences of African American students, perpetuating inequity and exclusion.

This chapter also introduced the theoretical frameworks guiding this study: Dis/ability Critical Race Theory (DisCrit) and Elite Capture. DisCrit provided a lens to analyze how both race and ability create room for the marginalization of Black males in education. It emphasized the way systemic racism and ableism operate together to disadvantage students of color in general and special education. Elite Capture supported this framework by examining how resources and opportunities are often appropriated by dominant groups (the elites), reinforcing systemic inequities and limiting access for marginalized populations. Together, DisCrit and Elite Capture provided a roadmap for understanding the experiences of African American males in science education.

The chapter concludes by exploring strategies for making learning more accessible and equitable for Black and Brown students. This final section emphasized the need for inclusive pedagogies and systemic reforms that address the needs of marginalized populations, particularly

African American boys and students with special education needs, to ensure a more promising and lucrative future. Through this literature review, the chapter sought to establish a deeper understanding of the historical and current factors that influence the educational outcomes of African American males, with a particular focus on their engagement in science education within general and special education contexts.

2.1 History of Education in the United States

To understand the systemic inequities in the schooling system today, we must examine the historical foundations of education in the United States. This history is deeply rooted in systemic injustices, particularly in its treatment of African Americans, dating back to the era of slavery. During this period, enslaved individuals were deliberately denied access to education as a means of maintaining control and preventing resistance. As Sanders (2016) explained: "Both slave masters and the enslaved recognized literacy as a key to humanness, a larger world, and freedom itself" (p.11). This quote highlights how literacy was not only a tool for personal and intellectual growth but also a pathway to empowerment and self-determination. Slave owners feared that if enslaved individuals gained the ability to read and write, they would challenge their oppression, seek liberation, and disrupt the existing social order. As a result, strict laws and punishments were put in place to criminalize Black literacy.

Laws were enacted to prohibit enslaved individuals from learning to read and write, with severe punishments imposed on both those who sought education and those who attempted to teach them. These restrictions were designed to uphold the system of oppression by keeping enslaved individuals uninformed and powerless. Even after slavery was abolished, systemic barriers to education persisted through segregation, underfunding, and discriminatory policies that disproportionately affected African Americans. Sanders (2016) highlighted the severity of these restrictions, stating: “An 1823 Mississippi statute stipulated that any slaves, free black people, or mulattoes found to be assembling for the purpose of teaching slaves to read or write should receive corporal punishment ‘not exceeding thirty-nine lashes’” (p.11). This law underscored the extent to which literacy was feared by those in power, as it was seen as a direct threat to the institution of slavery and the racial hierarchy it upheld. Even free Black individuals were targeted, emphasizing that denying education was not only about maintaining slavery but also about controlling the broader Black population.

The 1896 *Plessy v. Ferguson* ruling reinforced these disparities by establishing the “separate but equal” doctrine, which justified segregated schools that were vastly inferior for Black students. This ruling not only upheld segregation but also paved the way for widespread educational inequities that persisted for decades. One immediate consequence of this ruling was the systematic closure of Black schools. As Driver (2018) noted: “During the summer of 1897, the local school board in Augusta, Georgia, decided to eliminate the area’s lone public high school for black students” (p.41). This decision left Black students without accessible education, forcing them to travel miles, often on foot, to attend the nearest high school. For many, this was simply not feasible, leading to higher dropout rates and fewer opportunities for academic advancement. The removal of Black schools was not an isolated incident but part of a broader pattern of systemic exclusion that left African American communities without access to quality education.

The effects of *Plessy v. Ferguson* continued well into the 20th century, contributing to the deeply rooted educational inequities that still persist today. While the 1954 *Brown v. Board of Education* decision officially overturned the “separate but equal” doctrine, the legacy of segregation remained entrenched in the form of redlining, school funding disparities, and the disproportionate placement of Black students in special education programs. The foundation of educational inequality laid during this era continues to shape the experiences of Black students today, reinforcing systemic barriers that limit access to quality education and equitable opportunities.

2.2 Special Education

For this study, I define the term disability and establish its connection to special education in the United States. According to the U.S. Centers for Disease Control and Prevention (2023), a disability is: “Any condition of the body or mind (impairment) that makes it more difficult for the person with the condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions)” (para. 1). This definition highlights the broad scope of disabilities, encompassing physical, cognitive, and developmental impairments that can impact a person’s daily life and educational experience.

In the context of education, disabilities are addressed through special education services, which are designed to provide individualized support to students with diverse learning needs. The Individuals with Disabilities Education Act (IDEA), originally passed in 1975 and reauthorized several times, ensures that students with disabilities receive a free and appropriate public education (FAPE) in the least restrictive environment. Special education services include accommodations, modifications, and individualized instruction tailored to help students overcome learning barriers and access the curriculum effectively (New York State Education Department, n.d.).

By understanding how disability is defined and how special education has historically functioned in the U.S., we can critically examine the ways in which systemic inequities, including racial bias and resource allocation, continue to impact Black students in special education. This study explores these intersections, particularly how Black male students are disproportionately placed in special education.

2.3 Black Students in Special Education: What's Alarming About That?

The passing of *Brown v. Board of Education* (1954) and the Individuals with Disabilities Education Act (IDEA) (1975) brought hope to many, particularly to minoritized groups and individuals with disabilities. These landmark rulings were intended to eliminate segregation and ensure equal educational opportunities for all students, regardless of race or ability. However, in practice, these same laws have, at times, contributed to further segregation rather than fostering true inclusion. Ferri and Connor (2005) stated: "Most troubling is the finding that special education, although conceived as a way to provide support and access for previously excluded students, has paradoxically participated in maintaining rather than minimizing obvious inequities" (p.94). Instead of integrating students with disabilities into general education settings with appropriate support, special education has often functioned as a separate track, disproportionately enrolling students of color, particularly Black males, under subjective disability classifications.

This subjectivity was seen in the total number of black children enrolled in specific disability categories. Losen and Orfield (2002) reported:

> Since the early 1970s, national surveys by the Office for Civil Rights (OCR) of the U.S. Department of Education have revealed persistent overrepresentation of minoritized children in certain disability categories. The most pronounced disparities then were black children who, while only 16 percent of the total school enrollment, represented 38 percent of the students in classes for the educationally mentally retarded. After more than twenty years, black children constitute 17 percent of the total school enrollment and 33

percent of those labeled mentally retarded–only a marginal improvement. During this same period, however, disproportionality in the area of emotional disturbance (ED) and specific learning disabilities (SLD) grew significantly for blacks. (pp.xv-xvi)

This trend raises critical concerns about the role of implicit bias and systemic inequities in the identification and placement of Black students in special education. For instance, while Black students made up only 16–17% of the total school enrollment over the decades, they were disproportionately labeled with disabilities. Although this data does not specify the percentage of boys vs. girls, we can conclude that this disproportionality has reinforced racial and ability-based segregation within schools, limiting access to rigorous coursework and advanced opportunities.

2.4 Standardized Testing and Advanced Academic Opportunities

Black males were rarely enrolled in Advanced Placement (AP) courses, typically offered in high school and primarily attended by gifted students. According to the U.S. Department of Education Civil Rights Data Collection (CRDC), the total number of students enrolled in Advanced-Placement-Enrollment was 2,882,284. Of this total, 1,259,629 were males, including 104,851 (8.32%) Black males and 637,146 (50.58%) White males. The total Advanced-Placement-Science-Enrollment was 683,048. Of this total, 314,756 were males, including 20,529 (6.52%) Black males and 163,724 (52.02%) White males. How were schools in the United States of America able to maintain these numbers? The educational system has been running on a sorting and tracking system, favoring White and affluent children.

The educational system has long used standardized testing as a means of sorting and tracking students, a practice that became even more entrenched with the implementation of the No Child Left Behind (NCLB) Act. While these tests were intended to hold schools accountable for students' academic success, they also placed schools, particularly those in underserved communities, under heightened scrutiny. As a result, many teachers are forced to adhere to rigid, test-driven curricula, prioritizing test preparation over meaningful, student-centered learning. This emphasis on standardized testing has created a cycle in which test scores dictate educational opportunities, often to the detriment of students who need the most engaging and enriched instruction. Goodwin (1997) captured this issue well when she said:

> Indeed, it has been well documented that standardized tests assess low-level, decontextualized facts; are often used as the sole measure of achievement and capability, despite the fact they provide a fragmented picture of the learner; and frequently drive curriculum and instruction, particularly in poor and low-achieving districts, so that children who need the most enriched instruction are subjected to meaningless drill designed to improve standardized test scores. (p.xiv)

This overemphasis on standardized testing disproportionately affects students in underfunded schools, where teachers are pressured to teach to the test rather than foster critical thinking, creativity, and deeper understanding. Consequently, students in these schools often miss out on engaging, hands-on learning experiences, particularly in subjects like science, because instructional time is devoted to rote memorization and test-taking strategies. In fact, due to the No Child Left Behind Act and the emphasis on standardized testing, many elementary and middle schools have significantly reduced science instruction time to prioritize reading and writing preparation for these exams. Berliner (2011) exclaimed, "….instruction in science is down, on average, over an hour a week since NCLB became law. Schools can ignore a lack of growth on science tests because no sanctions are associated with that test" (p.290). This shift in priorities has led to fewer opportunities for students to access the science knowledge and skills needed for high school (this will be discussed under the importance of prior knowledge in science learning in Chapter 5).

This system of test-driven instruction also significantly contributes to the underrepresentation of minoritized students in Advanced Placement (AP) courses. Because standardized test scores often serve as a gatekeeping mechanism for advanced academic opportunities, students from low-income and predominantly Black and Latino communities are less likely to be identified as "gifted" or placed in accelerated learning tracks. However, they are overly represented in special education (Black boys' experiences in special education are discussed in significant detail in Chapter 5).

2.5 Public Education

Low expectations, poor academic performance, and systemic racism can contribute to behavioral challenges, especially when students become frustrated by their struggles. For Black boys, both with and without disabilities, behavioral issues are often handled unjustly, leading to disproportionate discipline compared to their White peers. Black boys are suspended and expelled at an alarmingly high rate. To better understand this statement, it is vital to consider data from the U.S. Department of Education's Office for Civil Rights, which oversees the Civil Rights Data Collection (CRDC). The CRDC is a mandatory survey of all public school districts and schools in the U.S. and Puerto Rico, covering 17,821 districts and 97,575 schools. The Office for Civil Rights collects data to inform reports and statistics (See Table 2.1).

Table 2.1

Enrollment and Disciplinary Actions Among Black Boys in Public Schools in the U.S

Category	Percentage (%)	Population (Based on 49.2M)
Total Student Enrollment	100	49.2
Black or African American Students	15	7.38
Black or African American Boys	8	3.936
In-School Suspensions (Black Boys)	15	590,400
Out-of-School Suspensions (Black Boys)	18	708,480
Expulsions (Black Boys)	18	708.480

Note: The percentages are based on the total enrollment of 49.2 million students of all races in the United States of America.

Out-of-school suspension rates for Black boys have reached alarming levels, primarily as a result of the zero-tolerance policy implemented in the 1990s. According to Knesting and Skiba (2001), the zero-tolerance policy emerged in response to rising concerns about violence, drugs, gangs, and weapons in schools. Starting in 1989, districts in California, New York, and Kentucky introduced mandatory expulsions for offenses like drugs, fighting, and gang activity. By 1993, zero-tolerance policies were adopted nationwide, expanding to include not just drugs and weapons but also smoking and general school disruption. While the policy was initially designed to address severe acts of violence and drug-related issues, schools have increasingly broadened its application to include behaviors like swearing and even incidents occurring outside of school, often serving their agendas (Knesting & Skiba, 2001). Many administrators hide behind the zero-tolerance policy when suspending and expelling African American boys.

2.6 Identity and STEM

According to the National Science Board (2022), for the United States of America to continue making progress in STEM, the underrepresentation in this field by minoritized groups such as African Americans, Hispanic Americans, and Native Americans needs to be addressed. Reports from the National Science Board (2022) stated: “Of the 14.6 million people ages 18 to 74 in the workforce, 34.9 million (24%) were employed in STEM occupations in 2021. Among racial or ethnic groups…the lowest share was among Black workers (18%).”. There is a startling underrepresentation of Black people in STEM careers in the U.S. It seems that after high school, the number of African Americans pursuing STEM is low compared to their White peers. Roy (2019) shared data from 50 schools combined across the U.S. Undergraduate enrollment in Engineering (out of a total enrollment of 622,502 students) for Black or African American males was 20,453 compared to 253,508 White males. The number of Black or African American males awarded a Bachelor’s degree in Engineering (out of 136 233 students) was 3,748 compared to 59,712 White males. Masters in Engineering enrollment (out of 93 559 students) was 915 for Black or African American males compared to 12,511 White males. The number of Master’s degrees in Engineering awarded (out of 66,340 students) to Black or African American males was 953 compared to 12,828 awarded to White males. Doctoral degree enrollment (out of a total of 78,715 students) for Black or African American males was 790 compared to 12,867 White males. The number of postgraduate degrees awarded (out of 12,156 students) to Black or African American males was 140 compared to 2,501 to White males. These numbers are only for engineering, not science, mathematics, or technology.

Research has shown that exposure to and exploration of science and mathematics in middle and high school increases their chances of pursuing STEM fields after high school (Ash et al., 2021; Hoogstra & Shernoff, 2001; Maltese & Tai, 2011; Wang, 2013). Additionally, early exposure to STEM subjects helps students build the foundational skills and knowledge necessary to succeed in more advanced coursework while boosting their confidence and interest in these fields. For underrepresented groups, such as Black students, these opportunities can be detrimental in providing pathways to careers in science, technology, engineering, and mathematics that may have otherwise seemed inaccessible. However, despite the proven benefits of early STEM engagement, disparities in access to quality STEM education persist, particularly in underserved communities, highlighting the need for targeted interventions to ensure equitable opportunities for all students.

Black boys in science classrooms have reported that their academic success is closely linked to seeing themselves represented in the curriculum. When their identity and culture are reflected in the material, they feel more engaged and connected, making learning more achievable (Kane, 2015). They stressed that when science lessons relate to their everyday lives, the content becomes more meaningful and easier to understand. Warren and Rosebery (2011) further support this by emphasizing the importance of sense-making in science education. Their study of a 7th-grade African American male student revealed that each student interprets and interacts with the world differently, and these diverse perspectives must be acknowledged in the classroom. For teachers, this means incorporating students' lived experiences and personal understanding to create a more inclusive and effective learning environment. This approach acknowledges Blackboys' identities and promotes deeper comprehension and engagement in science.

The experiences of Black boys in school underscore the urgent need for teacher education programs that prioritize cultural competence and equity, ensuring all students receive the support necessary to pursue their STEM goals (Ash et al., 2021).

2.7 Making Learning Accessible to Black and Brown Students

Research has shown that students learn better when the material relates to their everyday lives and home culture (Amanti et al., 2005; Dewey, 1956; Irish & Kang, 2018). It shouldn't be a situation where it is the child versus the curriculum. The child's experiences and culture should have some form of influence on the curriculum and inadvertently on their learning. Dewey (1956) suggests that new knowledge is built upon the knowledge students already possess. Bringing the students' home experiences into the classroom and forming a bridge to new learning can reduce the achievement gap seen in Black and Brown students. Amanti et al. (2005) refer to this as funds of knowledge. Students enter the classroom already equipped with a set of expertise. However, the study by Irish and Kang (2016) revealed that although connecting students' home experiences can promote learning, teachers need more training in making these connections.

There are instances when making the material relatable successfully piqued the students' interest in science. From my experiences, this is particularly true with teaching science to high school students in an under-resourced community. In my recent teaching of igneous rocks to my 10th graders, some of the students got excited when I told them that if they had ever gotten a pedicure before, the rock that the nail technician used to scrub their feet was an igneous rock called Pumice. Utilizing my students' experiences with science in their everyday lives can stimulate their interest in science (Bae et al., 2024; Kane, 2015; Ogodo, 2024; Warren & Rosebery, 2011). The students were more interested in learning about the rocks when they realized they use them daily. Ogodo (2024) expressed: "Students are often attracted to what interests them. Therefore, the subject matter must align with learners' interests or areas of familiarity to stimulate their interests" (p.5). Key (2003) tells her readers that many Black students view science as foreign and are not successful in science in school because the way the topics are approached is unrelated to their lives, communities, and cultures. She stated: "Multicultural science or culturally inclusive science is believed to be an enhancement for African American and other students of color" (p.88). Science teaching should reflect the culture of the students while also empowering them, as demonstrated in culturally relevant pedagogy.

Ladson-Billings (2021) reflected on her extensive research into culturally relevant teaching. She centered her recent work on a pivotal and transformative question: "What is right with Black students, and what happens in classrooms where teachers, parents, and students get it right?" (p. 2). This inquiry builds upon her 2014 research, which examined the effective practices of teachers in urban classrooms serving African American students, focusing on what educators were doing successfully to foster academic achievement and ensure student success. She identified three components of culturally relevant pedagogy, which she defines in her recent work as "an approach to teaching that relies on teachers as decisionmakers and intellectuals who are able to translate and implement research and policy" (p.2). By incorporating these three essential domains of culturally relevant pedagogy outlined by Ladson-Billings, teachers can create an environment that supports meaningful learning for students in urban classrooms.

Meaningful learning, according to Ladson-Billings (2021), is attained through these three components of culturally relevant pedagogy:

1. Student Learning: measured not by standardized tests but by the student's improvements within one school year.
2. Cultural Competence: how a teacher would help students navigate their culture to gain fluency and proficiency in the classroom.

3. Sociopolitical/Critical Consciousness: Teachers work in the classroom to help students apply, analyze, synthesize, and critique their environment.

By incorporating all three factors, the teachers in the Ladson-Billings study were able to help their African American students achieve academic success. As the diversity of the student population continues to evolve, teachers are responsible for ensuring that these students receive a quality education. Learning to infuse students' culture into the classroom is a substantive way of providing a thriving learning environment, especially for African American students in special education programs (Cartledge et al., 2016; Gay, 2002, 2010). Success for African American males in STEM is not a far-fetched idea. It is real, can happen, and has happened in the past.

2.8 Conceptual Framework

In this section, I explored the two theories, Dis/ability Critical Race Theory (DisCrit) and Elite Capture, which support this study of African American male students in science education and their learning of science. DisCrit was used to explore identity, power, and social justice while highlighting the injustices, including the misrepresentation faced by Black people and other marginalized groups, especially within the education system. "DisCrit explores ways in which both race and ability are socially constructed and interdependent. As scholars working within DisCrit, we seek to examine the processes in which students are simultaneously raced and dis/abled" (Annamma et al., 2012, p.5). Both race and ability are not merely biological or inherent traits but are socially constructed categories. These constructions are shaped by societal beliefs, practices, and power systems, and they often function together to marginalize certain groups of people.

Elite Capture also emphasizes the injustices, highlighting the allocation of resources to elite groups while taking away from marginalized groups. The elites are defined as: "..a small group of people who have power over a larger group of which they are part, usually without direct responsibility to that larger group, and often without their knowledge or consent" (Freeman, 1970, p.2). In the education system in America, which group of people have access to the best resources? Which group of people have a straightforward path to academic success? In my opinion, Elite Capture addressed these questions and, for this study, aided in understanding the reasons for the achievement gap between Black boys and their White peers.

Dis/ability Critical Race Theory (Discrit)

It is the year 2025; racism remains deeply entrenched in the U.S. education system despite progress since *Brown v. Board of Education* (1954). Society continues to assign categories based on race, shaping perceptions in schools and communities. Ladson-Billings (1998, p.9) highlights how categories like "school achievement," "middle classness," and "intelligence" become normative categories of whiteness, while categories like "gangs," "welfare recipients," "basketball players," and the "underclass" become the "marginalized and de-legitimated categories of blackness." A closer look at these categories would reveal that everything morally unacceptable is associated with Blackness. I would add special education to Ladson-Billings' list. I am in no way or form saying that Black students do not belong in this category. Still, more times than not, they are often overrepresented and miscategorized within it, reinforcing racial hierarchies in education.

Annamma et al. (2012) identified seven tenets of DisCRit. Although I wanted to focus on all seven for my study, I chose to focus on the four below.

1. DisCrit focuses on ways that the forces of racism and ableism circulate interdependently, often in neutralized and invisible ways, to uphold notions of normalcy.

This tenet was essential to focus on for my study because racism and ableism work together in schools, as racial biases often shape how students are identified and treated within categories of ability. For instance, Black boys are disproportionately labeled as having emotional or behavioral disabilities due to stereotypes that position them as disruptive or less capable.

2. DisCrit considers legal and historical aspects of dis/ability and race and how both have been used separately and together to deny the rights of some citizens.

By incorporating this tenet, I framed the overrepresentation of Black boys in special education and their underrepresentation in STEM and advanced programs within a larger historical and social context.

3. DisCrit emphasizes the social constructions of race and ability and yet recognizes the material and psychological impacts of being labeled as raced or disabled, which sets one outside of Western cultural norms.

In my study, this was used to explore how the intersection of being Black and labeled with a dis/ability affects Black boys' access to science education opportunities and their classroom experiences.

4. DisCrit privileges the voices of marginalized populations, which are traditionally not acknowledged within research.

This tenet was used to ground my methodology, as this study employed a narrative approach. This tenet within DisCrit aligns with the narrative approach because it amplifies the perspectives of my participants.

DisCrit and Special Education

According to Annamma et al. (2012), one of the rationales of DisCrit is to highlight the overrepresentation of Black and other marginalized groups in special education. This misrepresentation perpetuates segregation and harsher punishments, positioning Black boys as "dis/abled" in ways that stigmatize them and diminish their academic opportunities. Black male students experience harsher punishments and segregation in schools because of this dis/ability label. DisCrit highlights the oppression, injustices, and inequities in education faced by Black and other marginalized groups, reinforcing the systemic racial inequality in education and society at large (Annamma et al., 2016; Annamma & Handy, 2021).

In science classrooms, this inequity is particularly detrimental. Black boys thrive academically when they encounter culturally relevant curricula that affirm their identities and integrate their lived experiences (Cartledge et al., 2016; Gay, 2002, 2010). However, the current system too often ignores these needs. Misclassification in special education deprives Black boys of access to rigorous STEM curricula and reinforces a cycle of academic underachievement. (Ford et al., 2023). DisCrit provides a framework to interrogate these systemic barriers, focusing on how Black boys are positioned within science education and how their placement in special education disrupts equitable access to STEM opportunities.

DisCrit's application to Black boys in science education focused on systemic inequities and the lived experiences of Black men. This framework allowed educators and policymakers to address the overrepresentation of Black boys in special education and the broader societal stigmas that affect their identity formation. By understanding the intersections of race and dis/ability, educators can challenge the systemic barriers that undermine Black boys' potential in science education.

For example, incorporating culturally relevant pedagogy and equitable resource distribution can significantly impact Black boys' engagement and success in science. As Ladson-Billings (2021) emphasizes, effective classrooms focus on what works for Black students, valuing their cultural backgrounds and leveraging their unique perspectives to foster academic success. Similarly, addressing resource disparities such as access to science labs, materials, and extracurricular STEM programs can empower Black boys to excel academically.

Elite Capture

The unequal distribution of educational resources, particularly in urban schools serving predominantly Black students, reflects Elite Capture: "a phenomenon where resources transferred for the benefit of the masses are usurped by a few, usually politically and/or economically powerful groups, at the expense of the less economically and/or politically influential groups" (Dutta, 2009, p.3). In East Brooklyn, an urban neighborhood where my study was conducted, science classrooms lacked adequate teaching materials, functional labs, and extracurricular STEM opportunities. This disparity starkly contrasts with resource-rich schools in predominantly White and Asian communities, where students benefit from abundant resources and opportunities that foster academic achievement and access to STEM fields.

The historical denial of education to African Americans and the subsequent creation of unequal schooling systems exemplify the mechanisms of Elite Capture. From the deliberate exclusion of Black children in Thomas Jefferson's early educational proposals to the oppressive restrictions on literacy during slavery, dominant groups consistently sought to control access to knowledge. Education was recognized as a tool of empowerment, and its systematic denial of African Americans served to uphold racial structures. Anderson (1988) noted that Jefferson's 1787 proposal for public education in Virginia included provisions for White children while deliberately excluding the 40% of enslaved children in the state. Furthermore, legislation prohibited enslaved individuals from learning to read or write, with severe punishments such as the amputation of fingers for those who attempted to gain literacy (Anderson, 1988). These measures not only reflected the dehumanization of Black individuals but also reinforced the elite's desire to maintain social and economic control.

Even after the abolition of slavery, legal structures like "separate but equal" under *Plessy v. Ferguson* institutionalized disparities, ensuring that Black students received inferior education in underfunded, overcrowded schools. For instance, Clinton J. Calloway in (Anderson, 1988, p.157) described the conditions of schools attended by Black children during this period as deplorable, including weather-worn shanties and crowded classrooms with a single teacher. These realities illustrate how education systems were designed to perpetuate racial inequities, ensuring that Black students remained at a disadvantage.

The resistance to desegregation following *Brown v. Board of Education* highlights the persistence of elite capture in maintaining educational inequities. Anderson (1988) documented how states employed covert strategies to avoid integration, including the establishment of private schools for White students, manipulations of zoning laws, and underfunding of public schools in predominantly Black neighborhoods. These measures demonstrated the lengths dominant groups would go to preserve control over educational resources and opportunities.

In examining the science education experiences of African American male high school students, both in general and special education, Elite Capture and Dis/ability Critical Race Theory (DisCrit) provide essential frameworks for understanding how systemic inequities may shape their decisions and ability to pursue science-related fields after high school. Elite capture highlights how power and resources in science education are disproportionately controlled by privileged groups, often excluding marginalized students, particularly those in special education, from meaningful opportunities in STEM. Meanwhile, DisCrit helps unpack the intersection of race and disability, revealing how Black boys in special education face barriers due to both racial stigma and deficit-based perceptions of ability. Together, these frameworks provide a lens for analyzing how students perceive their science education, what factors influence their engagement and success, and how these experiences shape their post-secondary aspirations. This discussion naturally transitions into my methods chapter, where I detail the research design, data collection, and analytical strategies used to capture these students' lived experiences and the structural barriers they encounter in STEM education.

Chapter 3: Methodology

3.1 Qualitative Research Approach

This qualitative study used a narrative approach to examine the barriers and experiences of Male African American students in special and general education within the context of science education. A qualitative approach is a form of inquiry that takes place in a natural setting and gives importance to the voice of the participants (Creswell & Poth, 2018; Litchman, 2010). Creswell (2014) highlighted the main features of qualitative research:

> Qualitative research begins with assumptions and the use of interpretive/theoretical frameworks that inform the study of research problems addressing the meaning individuals or groups ascribe to a social or human problem. To study this problem, qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is both inductive and deductive and establishes patterns or themes. The final written report or presentation includes the voices of the participants, the reflexivity of the researcher, a complex description and interpretation of the problem, and its contribution to the literature or a call for change. (p.44)

This study highlighted the strengths of qualitative research in exploring complex issues, such as the science experiences of Black boys in general and special education in high school. Such research is particularly suited to understanding the meanings individuals or groups assign to social problems, aligning with my goal of uncovering my participants' more profound, lived experiences.

Similar studies have also employed a qualitative approach. For example, Booker et al. (2023) used qualitative methods in their research on the voices of Black males in special education. They conducted focus group interviews with seven participants to explore their experiences as special education students in general education classrooms. From these interviews, Booker et al. (2023) identified themes that informed their overarching goal of providing data to influence decisions by stakeholders, aiming to improve the quality of educational services for African American males in special education. Given their study's aim, soliciting their participants' perceptions and experiences was essential. The approach taken by Booker et al. (2023) influenced my research design, particularly in determining the number of participants and utilizing interviews as my primary data collection method.

3.2 Why Narrative?

As mentioned earlier, this study utilized a narrative approach. Clandinin and Connelly (2000) state: "... narrative is the best way of representing and understanding experience. Experience is what we study, and we study it narratively because narrative thinking is a key form of experience and a keyway of writing and thinking about it" (p.18). By speaking with my participants and using their experiences as data, I gained a deeper understanding of their science experiences. I minimized assumptions and obtained firsthand knowledge by going directly to the source. Merriam and Grenier (2019) refer to this design as: "…the use of *stories* as data, and more specifically, first-person accounts of experience told in story form" (p.10). The focus on an interpretive framework and an emerging qualitative approach validated my use of narrative methods, allowing me to examine the participants' perspectives. Additionally, including participant voices and my reflexivity ensured that my study is grounded in authentic experiences, offering a unique contribution to the literature on educational equity and potentially calling for systemic change in science education.

The practice of interviews dates to the ancient Greeks; however, “during the latter part of the 19th century, researchers began to use interviews to generate information for scientific studies” (Roulston, 2024, p.318). Through a series of interviews, my participants provided their perspectives on their science and schooling experiences, which were very personal and dear to them.

Similarly, Keats (2009), in detailing several examples of narrative research, highlighted the importance of participants’ stories;

> In a similar way, narrative research using a variety of narrative texts can serve both participants and researchers in gaining a richer and more complex understanding of participants’ experiences and generating new perspectives and knowledge. Offering participants multiple means of expressing stories around their observations, ideas, emotions, and activities can also expand a researcher’s opportunity to better understand the complex narrative participants construct about how they are living through experiences. (p.182)

The stories these boys shared helped me better understand their day-to-day interactions with science, their teachers, and education as a whole. I also gained insights into their lives as basketball players and team members. Storytelling is a way for human beings to make sense of their experiences and make them coherent. Polkinghorne (1995) asserted: “Stories express a kind of knowledge that uniquely describes human experience in which actions and happenings contribute positively and negatively to attaining goals and fulfilling purposes” (p.8).

Overview of the Methods

The rest of this chapter provides a general overview of the methods used in this study. A more detailed discussion can be found in the two findings chapters (Chapter IV and Chapter V).

Below, I discuss how and where the participants were recruited, after which I provide a brief overview of my data collection and data analysis process. A short section on reliability and validity is also included in the rest of this chapter below.

3.3 Research Setting and Participants

This study was conducted in an urban neighborhood in the eastern part of Brooklyn. I selected this location to recruit participants from urban communities, a choice integral to identifying educational inequities.

My study had eight participants, five African American male high school students. Their ages ranged from 15 to 17. Three of the five boys were in general education, while two were enrolled in special education programs. Two other participants were special education teachers at a high school in East Brooklyn. The last participant was the parent of one of the special education boys.

The number of participants was chosen based on similar studies found during my research and considerations of accessibility, ensuring the sample size was manageable for a narrative, qualitative study while still capturing diverse perspectives. For instance, Booker et al. (2023) gathered data from seven African American teenage male participants to explore the disproportionate representation of Black students in special education programs, emphasizing the depth and richness of individual experiences over larger sample sizes. Similarly, Henfield et al. (2008) conducted a study with ten African American males in special education to gather data for their research, demonstrating that smaller participant pools are sufficient for qualitative studies that prioritize detailed, contextualized insights. These examples validate my choice of participant numbers, as the aim was to provide a focused yet meaningful exploration of the boys' science and schooling experiences.

My participants were recruited from a community basketball team/league that met in July and August 2024. I chose a basketball team so that I could access a wide range of participants whom I did not currently teach or had previously taught to eliminate any biases in their responses about their science experiences. Participants I know from work and have a relationship with may want to tell me what they think I want to hear, not necessarily the truth. Also, if the participants believed I knew their science teachers, they may have hesitated to be honest in their responses.

After interviewing the boys, I decided to include perspectives from special education teachers and parents to gain deeper insights into the experiences shared by the special education participants. Teachers operate behind the scenes and have access to systemic knowledge and information that students often do not.

3.4 Recruitment and Informed Consent Procedures

During the summer basketball program, I started attending practice and was introduced to the boys by the coach. Before I approached any of them, I started attending their practices so that they would see me regularly. I would greet them when they came in and ask questions, such as, “How are you?” How was your weekend? Did you do anything fun over the weekend? By doing this, I started building a rapport with the boys. Building rapport with the boys made it easier for me to approach them about participating in my study. After two weeks, I noticed some boys frequently came to practice while others had other engagements that prevented them from coming daily. Based on this observation, I approached seven boys about participating in my study, and they all agreed.

The boys who agreed to participate in my study were given a consent form and an introductory letter to share with their parents (s) or legal guardians (s). Additionally, the participants were given an assent form to read and sign, ensuring their understanding and agreement to participate in the study. The recruitment process for the participants was conducted through their parents.

The special education teachers, Mr. Dior and Mr. Falium, were approached outside of their work hours to avoid any interference with their professional responsibilities. I explained the purpose and intent of my study to both teachers and asked if they would be willing to participate in an interview. I provided them with assent forms to review and sign upon their agreement. Similarly, I texted the parents of the special education participants to explain the study and invite them to participate. Both parents agreed and were emailed consent forms to sign. However, due to unforeseen circumstances, only one parent (Ms. Jane) could complete the interview. This approach ensured clear communication, respected participants' schedules, and adhered to ethical standards by securing proper documentation and maintaining transparency throughout the process.

3.5 Data Collection Procedures

Before data collection, I submitted my research proposal to the Institutional Review Board (IRB) for approval. I contacted the participants to confirm interview times and gather signatures upon approval.

The procedure of this research followed these structured steps. I first reached out to the basketball team coach, notifying him of my study and my desire to interview the boys on the team. Upon his approval, I then emailed the parents with my letter of introduction and intention. I received a positive response from at least seven parents. I then introduced myself to the participants and explained the purpose of my study to them. I presented the participants with the assent form, ensuring they understood the study's objectives, role, and right to withdraw from participation at any time. The parents were sent the informed consent forms via email.

Semi-Structured Interviews

Once participants were selected and the relevant forms signed, data were obtained through semi-structured interviews (lasting 45-60 minutes) (See Appendix A for the questions). "The rationale for using interviews was to present meaningful interpretations through students' in-depth narratives" (Booker et al., 2023, p.6). The interviews were recorded via Zoom to aid in transcription. Participants were notified that the Zoom recording was only audio and no video. I also notified them that they could still participate in the study if they chose not to be recorded. They all agreed to Zoom.

The second round of interviews was conducted in groups. I interviewed the general education boys for 45 minutes (see Appendix B for the questions). However, one of the boys was out of the country on a family vacation, so I could only interview two general education boys together. Similarly, I conducted a group interview with the two special education participants, which lasted 45 minutes (see Appendix C for the questions). All the boys consented to the group interviews and expressed no discomfort sharing their thoughts in a group setting.

At the start of the school year, I expanded the participant pool by including the special education teachers and the parents of the special education participants. This required me to amend my IRB protocol and resubmit it for approval. Once approval was granted, I contacted the additional participants to confirm interview times and gather consent signatures.

After work, I conducted individual interviews with each special education teacher, each lasting 60 minutes (see Appendix D for questions). Unfortunately, one of the parents was unavailable for an interview as initially intended, so I interviewed the remaining parent (Ms. Jane) individually for 60 minutes (see Appendix E for questions).

3.6 Data Analysis

After collecting all my interview data, I began my analysis by listening to the recordings of the interviews and manually cleaning up the transcripts. I then read and re-read the data to apply pseudonyms to the participants.

I then uploaded the transcripts on a software called NVivo 14. The software was on my laptop, and I could do a thorough reading. Through this thorough reading, I then coded the data by formulating themes based on commonalities in the participants' responses. I used NVivo for a detailed data review and applied deductive coding, where codes were predefined and matched the data. This process systematically categorizes text sections to align with common themes (Kuckartz, 2014).

I developed categories closely aligned with the research questions and goals to ensure rigor and consistency. Each category was clearly defined, balanced in detail, and validated by testing it on a subset of the data. Following Kuckartz's (2014) guidelines, these categories provided a framework for organizing and reporting findings.

Thematic analysis also required identifying any evidence inconsistent with the themes known as disconfirming evidence analysis (Brantlinger et al., 2005). This step ensured the findings accurately reflected the data by excluding outliers that did not align with the established themes. This thorough approach enabled me to summarize the data into cohesive narratives, analyze the results, and present them clearly in this study.

3.7 Role of the Researcher

As a researcher and high school science teacher during my time at Teachers College, I brought a unique perspective to my study. My six years of teaching in an underserved neighborhood allowed me to work closely with general and special education students, witnessing firsthand the lack of resources severely impacting their learning, particularly in science. This experience stood in stark contrast to my semester of student teaching at a school in a more affluent neighborhood, predominantly serving White and Asian students, where I observed an abundance of resources that fostered a significantly different educational environment. This disparity raised critical questions: Why was there such a stark difference in resource allocation? What systemic factors contributed to this inequity? These experiences shaped my commitment to investigating the structural inequalities in education. They informed the lens through which I approached my research, ensuring it was rooted in lived experience and critical inquiry.

3.8 Validity and Rigor

More research into the effectiveness of qualitative data has added to its reliability. According to Cypress (2017): "rigor is simply defined as the quality or state of being very exact, careful, or with strict precision or the quality of being thorough and accurate" (p.254). Tracy (2010) describes the rich rigor of qualitative study as one in which the researcher can answer the following questions:

- Are there enough data to support significant claims?
- Did the researcher spend enough time to gather interesting and significant data?
- Is the context or sample appropriate given the goals of the study?
- Did the researcher use appropriate procedures in terms of field note style, interviewing practices, and analysis procedures? (p.841)

Based on these definitions of rigor, the following elements of my research can be considered to meet rigorous standards.

I interviewed eight participants in this study: five students, two teachers, and one parent. Multiple participants increased the study's credibility by offering rich, thick descriptions (sufficient quotes/field descriptions) to provide evidence for the researchers' interpretations and conclusions. By integrating data from these diverse sources, I could cross-check information and identify consistencies and discrepancies in the findings. This triangulation enhanced the credibility and reliability of the data and provided a multi-faceted understanding of the factors influencing the boys' science education, from personal experiences to systemic inequities.

Multiple sources of data confirmed the explanation and aided data triangulation (Brantlinger et al., 2005; Eisner, 2017; Tracy, 2010). By employing both the DisCrit and Elite Capture theories, I incorporated multiple perspectives in interpreting my data. Brantlinger et al. (2005) referred to this as theory triangulation, which adds rigor to the study and validity.

3.9 Limitations

One limitation of this study was the small sample size, which consisted of only five student participants. A larger sample size would have increased the generalizability of the findings and provided a broader understanding of the student's experiences. Additionally, challenges in recruiting participants solely from the special education population limited the study's ability to explore the full range of experiences within that group. The data collection methods, which included one-on-one and group interviews, while valuable for capturing personal and collective narratives, may have offered a limited perspective on the participants' experiences. Additional methods, such as classroom observations, might have enriched the data and provided a more comprehensive view of the participants' engagement and experiences in their science classrooms.

The study also had a limited timeframe for data collection. It was conducted during summer break, when participants and their families often planned vacations, particularly in August. This restriction reduced the time available for in-depth exploration. However, since the participants were not in school, they had more flexibility in their schedules compared to if it were during the academic year or school time. They also did not have the added pressures of homework, exams, and other educational responsibilities, allowing them to be more focused on answering the questions.

On the other hand, interviewing teenage boys presented other unique challenges. Many struggled to articulate their experiences fully or reflect on the deeper meanings behind their interactions and engagement with science. These factors may have impacted the depth and scope of the data collected.

Organizing the Findings Chapters

As I transition into the findings chapters of this study, I explore the participants' experiences and insights. The chapters are organized to reflect this division since I had two distinct groups of participants: general education and special education.

In Chapter 4, I present the findings gathered from the general education participants, highlighting their engagement with science and the factors that shaped their experiences in high school.

Chapter 5 delves deeper into the experiences of special education participants, including the perspectives of students, teachers, and one parent. It provides a nuanced understanding of the unique challenges and opportunities faced by these participants, shedding light on the intersection of education, identity, and support systems. These chapters offer a comprehensive view of how African American male students navigate their science education across different educational settings.

Chapter 4: Exploring the Perceptions and Experiences of Science Education Among General Education Boys in Urban High Schools: Insights into Engagement and Access

Abstract

This study investigated the science education experiences of Black boys in East Brooklyn high schools, which focused on their perceptions of access, pedagogy, and systemic challenges. Drawing upon Elite Capture as a theoretical framework, the research emphasized the quality and distribution of educational resources in urban neighborhoods, particularly within science classrooms. The participants, all high school students and basketball players from different schools, provided narratives highlighting the complex relationship between their athletic goals and academic ambitions. Although sports played a central role in their lives, these boys were passionate about sharing their perceptions about their science education. Their stories emphasized the significance of effective pedagogy, hands-on learning opportunities, academic rigor, and the detrimental impact of standardized testing on their educational journeys. The findings of this narrative and qualitative study offer insights into how systemic barriers can be addressed to support Black boys' success in science education. Recommendations are provided for policymakers to develop and implement equitable policies that foster an inclusive and empowering learning environment.

Keywords: Black boys, urban neighborhoods, pedagogy, science education, access, systemic challenges

4.1 Introduction

Science education is crucial in preparing students for participation in STEM fields; however, Black boys remain underrepresented in these areas (National Science Board, 2022). Historical and systemic barriers, including inequitable resource distribution, standardized testing biases, and disparities in pedagogy, contribute to these outcomes. Black boys in urban schools face unique challenges regarding access to opportunities and educational experiences. Middle and high school science experiences have been known to influence students' decision to pursue STEM fields after graduation (Ash et al., 2021; Hoogstra & Shernoff, 2001; Maltese & Tai, 2011; Wang, 2013). Despite persistent systemic inequities, the participants in this study demonstrate resilience and intentionality in pursuing academic and athletic aspirations. This study draws upon the framework of Elite Capture to examine how these systemic factors shape the quality of educational resources and opportunities available to Black boys in urban/ underserved neighborhoods.

Using a narrative, qualitative approach, this research centers Black boys' voices by presenting their insights on pedagogy, hands-on learning, academic rigor, and the role of standardized assessments in their science education. By centering their experiences, the study seeks to identify actionable strategies for policymakers and educators to reframe policies and practices that hinder equity and success in science education. It amplifies the critical need for equitable access to high-quality science education, emphasizing how targeted changes can empower Black boys to excel in their educational pursuits.

4.2 Literature Review

Inequitable Resource Distribution

Studies on Elite Capture often focus on monopolizing resources such as land and opportunities and exploiting loopholes to obtain property (Burrows & Knowles, 2019; Cashin, 2021; Lauermann & Mallak, 2023). While these studies mention “opportunities,” the emphasis is typically on land and property acquisition rather than educational opportunities. Cashin (2021) briefly mentioned school funding but did not discuss educational opportunities. In this study, I shifted the focus of opportunities to include educational opportunities as a resource, specifically in science, to demonstrate how elite capture can also be applied to understanding how Black boys’ lack of science opportunities/resources in urban high schools across the U.S. can shape their engagement and success in science.

Today, the unequal distribution of resources in schools serving predominantly Black students continues this legacy. For example, science classrooms in East Brooklyn often lack adequate teaching materials, functional labs, and extracurricular STEM opportunities, while schools in predominantly White and Asian communities are better resourced. Adjapong (2021) talks about Black students not having access to quality education: “90 percent of districts primarily serving Black and Latinx students reported difficulties recruiting and retaining certified, knowledgeable STEM teachers” (20:09). This disparity mirrors the historical inequities that began during slavery and persisted through today. Elite capture remains a central force in shaping these disparities, as the interests of privileged communities overshadow the needs of marginalized students. By addressing this systemic capture of educational resources, we can dismantle the structural barriers hindering Black boys’ success in science education and beyond.

The concept of Elite Capture, as seen in global contexts, provides a lens through which we can understand the inequities in the U.S. education system. Lauermann and Mallak (2023) highlighted how government resources are disproportionately allocated, leaving some villages in India without basic infrastructure like roads. This "selection bias," as Dutta (2009) terms it, thrives on corruption, which manifests through practices such as bribes and collusion. Dutta states: "Corruption is popularly considered as a measurable instrument to grasp the functioning of elite capture within local governments" (p.4). Similarly, Dutta noted that the most marginalized groups within a government, often the poor and less powerful, bear the pressure of this corruption.

In East Brooklyn, where science classrooms are under-resourced and students lack access to essential opportunities, it is reasonable to question whether a form of corruption or systemic bias is at play. The stark contrast in resources between predominantly Black schools and those in wealthier, predominantly White, and Asian communities reflects the dynamics of Elite Capture. Just as corruption in governments favors dominant groups, resource allocation in education appears to serve the interests of privileged communities while neglecting the needs of marginalized students.

Opportunity hoarding, another manifestation of elite capture, further illustrates this inequity. Lauermann and Mallak (2023) highlighted that: "Opportunity hoarding seeks to prevent others from accessing resources or opportunities available in a place" (p.648). This is evident in the unequal distribution of science materials, as well as the presence of science classes in some schools, extracurricular STEM programs, and advanced learning opportunities (Buxton, 2006; Tate, 2001; Lynch, 2000). These disparities ensure that certain groups maintain their advantage, perpetuating a cycle of privilege and marginalization.

Examining these global and local patterns reveals that Elite Capture operates at multiple levels to reinforce inequities. Whether through the misallocation of government resources abroad or the systemic denial of educational resources to urban schools in the U.S., Elite Capture sustains power imbalances that hinder the progress of marginalized communities. In East Brooklyn, this disproportionately affects Black boys, limiting their access to quality science education and their potential for success in STEM fields.

My research into Elite Capture discovered its application in the unfair distribution of government resources in nations worldwide (Lauermann & Mallak, 2023). For example, some villages in India do not benefit from government-allocated resources for constructing roads. Dutta (2009) refers to this form of Elite Capture as selection bias, which cannot exist without corruption. A clear connection can be drawn between the inequities Black boys face in both general and special education regarding their science experiences and the systemic injustices that perpetuate these disparities throughout their schooling.

To contextualize the concept of Elite Capture, this literature review examines the literature on the science experiences of Black males. Elite Capture refers to the way dominant groups control resources and opportunities, often to the detriment of marginalized groups. By focusing on the science experiences, I highlight the demands placed on Black boys for academic success in a system that withholds necessary support, resources, and equitable opportunities while also exposing the systemic oppression they face daily.

Black Male Experiences in Science Education

The experiences of Black boys in science education in the United States have been both positive and negative. Some struggle for academic success in racially hostile institutions, while some have used this struggle to motivate themselves for success. Robins (2022) describes a concept he calls grit to explain students' persistence, diligence, and focus for learning. Robins claims that receiving good grades is not enough for success, but grit is also needed, especially in predominantly white institutions. Robins' study proved that Black boys who possessed this grit and drive for success were successful in science and other STEM fields. Another study by Adams et al. (2013) demonstrated that possessing grit can serve as a protective factor against suicidal ideation among young people. However, grit does not address systemic oppression. I believe that resilience is essential for minoritized groups in the U.S. to navigate the often-hostile environments they encounter, particularly in STEM fields, in order to achieve academic success.

According to Mensah and Pierre (2025), resilience is defined as: "Black students' ability to press forward in their studies despite learning within hostile learning environments or 'against all odds' stacked against them" (p.2). Black boys often face the negative stigma of being aggressive and not intelligent enough to achieve academic success (Burgess & Mensah, 2022). In such hostile environments, resilience is essential to navigating the socio-emotional challenges that come with these harmful stereotypes. Research by Bentley and McGee (2017) highlights the critical role resilience plays in the lives of high-achieving Black students dealing with harmful stereotypes, stigmas and prejudices.

There are also accounts where negative classroom experiences have caused Black boys to shut down, proving the need for resilience. Burgess and Mensah (2022) discuss a case study where two Black boys were punished for expressing themselves. Their White female teacher did not view their personality (speaking loudly) as normal behavior, and in turn, they were reprimanded. She made comments implying that these boys would never go to college. This study shows that this teacher had meager expectations for these boys, and they were very aware of her feelings. While these Black boys were highly interested in science, their aspirations of entering the STEM field could potentially be shattered by this White teacher. Having resilience would definitely be a key factor for these boys in achieving academic success.

In another study, Brooms (2019) noted a correlation between motivation and academic success. A group of 20 Black boys in an all-boys public charter secondary school testified of a strong motivation to succeed in school. However, they also identified that motivation came from both within and outside factors (teachers, friends, and family). Regardless of any negative stereotypes they knew existed by being Black, they were motivated enough to prove those stereotypes wrong and could be academically successful.

Black boys in science classrooms have shared that their academic success is closely tied to their ability to see themselves represented in the curriculum. When their identity and culture are reflected in the material, they feel more connected and engaged, which makes learning more attainable (Kane, 2015). They emphasized that when science lessons relate to their everyday lives, the content becomes more meaningful and easier to grasp. Warren and Rosebery (2011) further support this idea by highlighting the importance of sense-making in science education. Their study of a 7th-grade African American male student found that every student interprets and interacts with the world differently, and these unique perspectives must be acknowledged in the classroom. For teachers, this means tapping into students' lived experiences and personal understanding to create a richer and more effective learning environment. This approach validates Black boys' identities and fosters deeper comprehension and engagement in science.

These experiences of Black boys in school settings emphasize the critical need for teacher education programs to promote cultural competence and equity in the classroom, ensuring that all students, regardless of background, have the support they need to pursue their STEM ambitions. How teachers view and treat students can have lifelong effects, for them, it can mean the difference between gaining or not gaining economic stability. Forced to repeat a cycle of poverty with a reliance on welfare and the government/ system to survive.

Disparities in Pedagogy

The way teachers treat students and the methods they use to teach (pedagogy) can significantly influence students' academic success. As the demand for individuals to fill STEM positions continues to rise, nations face a great challenge and responsibility to cultivate a competent workforce for these roles. In the United States, World War II highlighted the need for improvements in the educational system. DeBoer (1991) stated: "...effect of the war was that it showed how important science, mathematics, and technology were in successful conduct of military efforts" (p.128). Jobs like weapon development, data analysis, and logistics personnel were crucial then and continue to be in demand today. The importance of basic skills and knowledge, especially in health-related fields, became even more apparent during the recent COVID-19 pandemic, just five years ago.

The increasing demand for STEM professionals underscores the need for an educational system that not only emphasizes technical skills but also fosters critical thinking, problem-solving, and innovation. Effective pedagogy plays a crucial role in shaping students' academic success, particularly for Black students in STEM fields. My findings report that students are distressed about the science curriculum not reflecting their culture. Multicultural education is essential in creating an inclusive learning environment that recognizes the diverse cultural backgrounds of students and reflects these perspectives in the curriculum. Atwater (1993) expressed: "Multicultural science education is a field of inquiry with constructs, methodologies, and processes aimed at providing equitable opportunities for all students to learn quality science in schools…" (pp.34-35). In my opinion, one way to provide equitable opportunities is by incorporating students' outside culture, whether it be their community, history, or lived experiences to bridge the gap between their world and the scientific concepts they are learning. "Multicultural education represents an attempt to make the curriculum more responsive to the educational needs of all students" (Ladson-Billings, 1992, p.102).

This is just one dimension of multicultural education and Banks (1993) refers to this as content integration: "…..the extent to which teachers use examples, data, and information from a variety of cultures and groups to illustrate key concepts, principles, generalizations, and theories in their subject area or discipline" (p .5). My focus on this dimension is influenced by my findings which are discussed later in this chapter and my opinion on what makes science access equitable for Black students. A multicultural approach does not only incorporate a student's culture which is important but it also equips them with the tools needed to critically reflect on their science experiences (Mensah, 2013).

4.3 Theoretical Framework

In U.S. society, racial diversity exists alongside a social hierarchy that often divides people into the elites and the non-elites. Freeman (1970) defined elites as: "... a small group of people who have power over a larger group of which they are part, usually without direct responsibility to that larger group, and often without their knowledge or consent" (p.2). In this study, I am focusing on the elites as a group that typically holds the majority of opportunities, wealth, and resources, and in American society, that group is usually composed of White individuals. In contrast, minoritized groups, including Black or African Americans, Hispanics, and American Indians, are often categorized as non-elites, facing systemic barriers to accessing comparable levels of privilege and resources.

This study employs Elite Capture as a theoretical framework to examine how the unequal distribution of resources in urban neighborhoods limits the success of minoritized groups in science compared to their White peers. Taiwo (2022) reported on the origination of elite capture. He said: “The study of elite capture originated in the study of developing countries to describe how socially advantaged people tend to gain control over financial benefits, especially foreign aid, meant for others” (p.13). In this study, I applied the concept of Elite Capture to demonstrate how socially advantaged groups, such as the White majority in the U.S., have taken control of educational resources, leaving marginalized groups, such as African Americans, with limited or no access to these resources. Seiler et al. (1999) reported:

> Students in poverty tend to attend schools that use outdated textbooks, have minimal laboratory equipment, and have limited science club participation or provision for after-hours science. In addition, for students in poverty, participation is restricted in summer camps, poorly qualified teachers tend to be assigned to their schools, and science education is not perceived as a priority. (p.172)

The historical exclusion of African Americans from education and the establishment of inequitable schooling systems serves as clear examples of Elite Capture at work.

4.4 Methods

This study employed a qualitative, narrative approach to explore the perceptions and experiences of general education boys in urban high schools regarding their science education. Erickson (2024) described qualitative inquiry as an approach that: “seeks to discover and to describe narratively what particular people do in their everyday lives and what their actions mean to them” (p. 33). This definition highlights the emphasis on understanding participants’ lived experiences and the meanings they attach to their actions. By interviewing the boys, I was able to gather firsthand accounts of their science experiences at school, uncovering insights into how they perceive, navigate, and engage with the subject within their educational environments. Further, Creswell (2014) gave the following definition of qualitative research, which aligns with this study:

> Qualitative research is an approach to exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The research process involves emerging questions and procedures, data typically collected in the participants' setting, data analysis inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data. (p.4)

By listening to the boys' perspectives, I explored and understood the meanings they connected to their experiences in science education, particularly concerning inequitable access to resources. Following the qualitative research process described in the quote, I developed open-ended questions to guide my inquiry and gathered data directly from the participants in their sporting environment. I identified patterns and formulated themes based on the boys' narratives through inductive data analysis. These themes provided a structured way to report their experiences and shed light on the systemic issues impacting their science education.

The use of narrative inquiry in education is well-established. Clandinin and Connelly (1990) noted that: "narrative inquiry is increasingly used in studies of educational experience. It has a long intellectual history both in and out of education" (p. 2). This approach highlights the importance of listening to participants and ensuring their voices are authentically represented. This study prioritized amplifying the participants' perspectives, allowing their experiences and insights to take center stage.

The Setting and Participants

This study was conducted in an urban neighborhood in the eastern part of Brooklyn. I chose this neighborhood with the hope of recruiting participants who went to school there. Urban schools frequently face challenges such as resource disparities, which are manifestations of elite capture, where socially advantaged groups control educational resources, leaving marginalized communities with inadequate support. By situating this study in an urban setting, I aimed to highlight how these disparities hinder students' preparedness for STEM jobs and opportunities after high school while perpetuating broader patterns of inequality.

Before interviewing the boys, I visited their locations as they traveled for practice and games with other teams. When the boys got to know me better, I explained the purpose and intent of my study and asked if they would be interested in participating. The three boys agreed after which they sought consent from their parents.

This study had three participants; see table 4.2 below for more details.

Table 4.2

Participants in the Study

Name	Age	Ethnicity	Household Size	Likes	Future Aspirations
Julian	17	African American	4	Reading, gardening, gaming	To work as a detective (forensic science)
Jalen	16	Haitian	4	Basketball, video games, eating good food, cracking jokes, being outside	Basketball player in the NBA
Caleb	16	Afro-Caribbean	6	Basketball, football, video games	Basketball player in the NBA or a football player in the NFL

Why a Basketball Program?

As a high school science teacher, I have observed that many of my male students, as well as some of the girls, are deeply passionate about basketball. From the moment they enter ninth grade, many of them set their sights on making the school team. I often listen in on their conversations about their favorite players. Their voices light up with excitement when they talk about LeBron James or Stephen Curry. I can see the fire in their eyes, the joy, the reverence. I find myself wishing they spoke about science with that same kind of passion.

The young boys often wear the latest Jordan sneakers with pride, treating them with great care and affection. For some, those sneakers are more than just fashion; they are symbols of aspiration. No one dares to step on a fresh pair of Jordans without risking a confrontation. When I speak with my students about basketball, they often tell me that it represents more than a game; it's their way out of poverty. They see basketball as a legitimate and realistic path to success, driven by the visibility of Black athletes who have "made it." They talk about using basketball to help their families, drawn by the promise of fame and financial security. This begs the question: Why is basketball so often presented as the only viable pathway out of poverty for Black boys? Why isn't a career in STEM offered with equal passion or glamor?

In my view, this overemphasis on sports, particularly basketball, is not accidental. From an Afro-centric perspective, I believe the glamorization of basketball serves to steer Black boys away from academic tracks like STEM, tracks that would provide not only economic opportunity but intellectual liberation. The problem isn't that they dream of being athletes; the problem is that no one tells them they can be both athletes and scientists, engineers, or doctors. No one teaches them the importance of understanding contracts, managing wealth, or negotiating deals, skills that require literacy, critical thinking, and numeracy.

What happens when the dream of basketball doesn't materialize? What happens when injuries arise or when a player is manipulated by a contract they don't fully understand? These are real risks, and no one is preparing these young men for those outcomes. Many of my students who play basketball don't even understand the basic science behind their sport. They don't know why they fatigue after five minutes on the court, why warm-ups are essential, or how lactic acid builds in their muscles. Science could help them understand and improve their athletic performance, but no one is connecting those dots for them.

Historically, this pattern is not a new phenomenon. During slavery and the Reconstruction era, Black people were deliberately denied education, specifically the ability to read and write, because literacy would make them less susceptible to manipulation and exploitation. The freedman who couldn't read a contract was easier to cheat and control. Today, we see echoes of that same disempowerment in the way education and literacy are disconnected from the paths young Black boys are encouraged to pursue.

I interviewed the boys over the summer during their summer Basketball program. From an Afro-centric viewpoint, these spaces represent culturally relevant environments where these boys demonstrate intellectual rigor and creativity. By situating the study in this context, I highlighted how their natural problem-solving abilities and collaborative efforts on the court could inform and inspire approaches to learning and science education.

I interviewed the boys individually, one-on-one, and then as a group (see Appendices A and B). I conducted the interviews after practice at the practice location. We were always in a private area, a safe distance from people around, and the boys felt comfortable being interviewed there. I asked open-ended questions, allowing the participants to share their personal stories in depth. My interview protocol included questions such as:

- Can you share a specific example of a time when your background or identity impacted your experience in a science class or activity/project?
- Are there any barriers you face in your science education, such as access to resources or opportunities? If yes, explain.
- How do you feel about your current science classes? Are there aspects of the curriculum that you find particularly engaging or challenging?

These questions were asked to elicit details from the participants about their science learning experiences, challenges, success, and future aspirations. This allowed the participants to share their personal stories and experiences in their own words and let their voices be heard. By exploring these stories, the interviews revealed how school, environment, and teacher interactions may or may not influence students' experiences in science education.

During my initial interviews, I also asked the boys to draw their ideal science teacher (see Figures 4.1 and 4.2) to explore the characteristics they valued in an educator. This method allowed me to gain insight into their perceptions beyond verbal responses, capturing both explicit and implicit preferences. I was particularly interested in whether they emphasized qualities such as teaching style, personality, or subject expertise, as well as whether race and gender played a role in their ideal teacher. By incorporating this visual and narrative approach alongside traditional interviews, I aimed to understand how these students conceptualized effective science instruction and whether identity factors influenced their perceptions).

Researcher Role

This study positioned me as an interpretive bricoleur. Cannella et al. (2024) describe the interpretive bricoleur as someone who: "… understands that research is an interactive process shaped by one's personal history, biography, gender, social class, race, and ethnicity, as well as those of the people in the setting" (p. 16). As a Black/Afro-Caribbean female living and teaching in an urban neighborhood, I have witnessed firsthand the systemic inequities affecting Black boys in the school system. This perspective allowed me to connect with and better understand the experiences shared by the boys in the study.

I employed open-ended questions with care, ensuring that my feelings or biases did not influence the phrasing or the depth of information sought. I encouraged authentic and meaningful responses without leading or shaping their answers. I fulfilled this role effectively, maintaining awareness of my biases while ensuring they did not impact the research process.

Data Sources

The data for this study were collected through two rounds of interviews. The use of interviews dates to the Renaissance period; according to Roulston (2024): "since the Renaissance period, the interview has transformed from meetings of elites into a means of gaining information used by people from all walks of life" (p.317). The first round of interviews took the form of three one-on-one interviews conducted separately with each participant. This format allowed for a deeper exploration of each boy's unique experiences and perspectives in a private setting, encouraging personal responses.

During the first interview, I asked the participants to draw their ideal science teacher (Mensah, 2011) to explore how their perceptions of an effective science teacher might correlate with their personal experiences and engagement in science. In Mensah's study, she used the DESTIN procedure, in which pre-service teachers created two sets of drawings, one before and one at the end of their education program. Their initial drawings depicted the type of science teacher they did not want to become, while their final drawings represented the teacher they aspired to be. I adapted this approach by asking the boys to create a single drawing (See findings for a sample of drawings collected) based on their own science experiences, illustrating the characteristics they believed an ideal science teacher should have.

I examined the characteristics the participants included in their drawings by analyzing both the visual elements and their explanations during our discussions. During my thematic analysis, I identified recurring themes based on what the students depicted and how they described their ideal science teacher. This approach allowed me to interpret not only the explicit traits they valued, such as teaching style, personality, or subject knowledge, but also any underlying patterns related to race, gender, or other influential factors in their science experiences. This exercise provided a visual and creative way to analyze the values, characteristics, and qualities that participants associate with successful science learning. These drawings revealed whether their experiences, both positive and negative, informed their conceptualization of an ideal science teacher.

The second round involved a group interview via Zoom with two of the three participants. This was done over Zoom because the Fall academic semester had already started and to minimize risks of disrupting their homework and academic responsibilities, I opted for a Zoom interview. This group setting allowed for an exchange of ideas, providing insights into shared experiences and perspectives and how the boys' views interacted with and influenced one another. The combination of individual and focus group interviews was intentional, designed to capture both personal narratives and differences in opinions, enriching the quality of the data collected.

Data Analysis

After collecting the interview data, I began my analysis by listening to the recordings and manually refining the transcripts. Tracy (2019) highlights this first step in data analysis as crucial. The second step I followed was reading and re-reading the data. Tracy stated: ".... I recommend that researchers submerge themselves in the entire breadth of the data by reading, re-reading, listening and thinking" (p.213). This step assisted me in coding the data and making the data anonymous: "When making the data anonymous, all of the sensitive data in the form of names, places, dates and the like, must be replaced by pseudo names or abbreviations" (Kuckartz, 2014, p.126).

I then uploaded the transcripts to NVivo 14, a qualitative data analysis software, to aid in thematic analysis. "QDA software can be integrated into every phase of thematic text analysis to very effectively assist in the analysis…" (Kuckartz, 2014, p.72). This type of analysis, also known as coding is commonly used in qualitative, data analysis. Qualitative coding involves two types of coding processes: deductive and inductive (Delve, 2020). Deductive coding starts with the codes and then matches the data to the codes. With inductive coding, the opposite is done; codes will be derived from the data. According to Kuckartz (2014), this would require me to "work through the text section-by-section and line-by-line from beginning to end, to assign text passages to categories" (p.72). This thorough analysis enabled me to categorize different parts of the text (data) into themes such as curriculum, academic rigor and cultural relevance, pedagogy, standardized testing, and critical consciousness.

In qualitative, thematic analysis, one part of the data/text may fall into several categories (Kuckartz, 2014). The rules for the category system, based on Kuckartz, are as follows:

Be established in close connection to the research question and goals of the given project;

- Not be too detailed or too broad;
- Contain a precise, detailed description of the categories;

- Be formulated with the report of results in mind. For example, categories should be selected that are suited to give structure to the research report at the end of the analysis process, and
- Be tested on a section of the data material. (p.73)

I applied the steps Kuckartz (2014) outlined to guide my study's thematic analysis.

First, the categories were established in close connection with the research questions and goals of the project, ensuring that the analysis aligned with the central focus of understanding the science experiences of African American male students. I ensured the categories were neither too detailed nor too broad, allowing for a comprehensive yet focused data analysis. Each category was precisely defined with detailed descriptions to ensure consistency and clarity during the coding process.

Additionally, I formulated the categories with the final research report in mind, selecting themes that would provide a clear structure and coherent narrative for presenting the findings. To validate the appropriateness of the categories, I tested them on a section of the data material before applying them to the entire dataset. This systematic approach ensured that my thematic analysis was rigorous, relevant, and directly connected to the research objectives.

A careful evaluation and revision permitted me to write the narrative for this study. This involved summarizing the data into themes and then analyzing and presenting the results. Part of the analysis process involved looking for evidence inconsistent with the themes. Brantlinger et al. (2005) call this case analysis disconfirming evidence. These outliers were removed from the summaries.

Validity and Rigor

Lincoln and Guba (1985) discuss member checking to enhance the credibility and validity of a study. After categorizing my data, I shared this information with the participants through follow-up discussions, allowing them to verify its accuracy and relevance. I presented a concise and accessible summary of the findings, ensuring the language was clear and relatable. They had the opportunity to confirm whether the data accurately reflected their experiences, add any missing details, or correct any misrepresentations. Some participants expanded on their initial responses, offering deeper insights into their science education experiences. This member-checking process not only enhanced the validity of my findings but also reinforced the collaborative nature of the study, ensuring that participants' voices and perspectives were authentically represented. I then gave the boys a concise summary of what was revealed in the interviews for their approval. The participants provided feedback, clarified any misunderstandings, and offered additional insights. This process ensured that the participants' voices were accurately represented in the study.

4.6 Findings

This chapter presents the findings from interviews conducted with three Black boys enrolled in general education programs at different high schools in Brooklyn. Julian, Jalen, and Caleb participated in the same summer basketball program, which brought together Black boys from various neighborhoods in Brooklyn. While they shared a passion for basketball, they did not know each other before the program and came from diverse academic, familial, and community contexts. The three participants represented a range of experiences shaped by their differing school environments, grade levels, and family dynamics. Caleb and Jalen, both 16 years old, were preparing to enter their junior year, while Julian, 17, was transitioning into his senior year. Their family structures varied from single-parent households (Caleb) to nuclear families (Jalen and Julian), and they resided in different neighborhoods within Brooklyn, adding to the differences in their perspectives on education and personal growth.

This chapter explores the boys' perceptions and experiences of science education in their respective schools. By focusing on their narratives, this chapter seeks to uncover how their contexts influence their engagement with science, their reflections on pedagogy, and their aspirations within and beyond the classroom. These findings explain the connection between their academic and personal lives and the broader systemic factors shaping their educational journeys.

Curriculum: Academic Rigor and Cultural Relevance

For context, I define academic rigor and cultural relevance while explaining why I placed both under the curriculum. Draeger et al. (2013) stated: "However, we argue that academic rigor is illustrated when students are actively learning meaningful content with higher-order thinking at the appropriate level of expectation in a given context" (p. 268). I focused on the part of this definition that emphasizes "learning meaningful content," as what qualifies as meaningful is often subjective. My interpretation of meaningful content might differ entirely from someone else's, especially when cultural context is considered. Therefore, I define cultural relevance as the idea that something resonates with a specific group of people or an individual, connecting to their experiences, identities, or values. A curriculum designed to provide meaningful content may fail to achieve its goal if it is not culturally relevant. For instance, if the curriculum does not align with a group's lived experiences or future aspirations, it may seem irrelevant or unhelpful (Riley & Mensah, 2023).

One of the participants, Caleb, expressed this sentiment clearly. When asked about his feelings toward school, he responded: “I just feel like some of the stuff I’m learning is not helping me in the real world. Like for when I grow up and stuff.” However, Caleb noted his appreciation for mathematics: “That’s something I use every day.” This contrast highlights the disconnect he perceived between the science curriculum and his real-world needs, suggesting that the curriculum neither aligned with his cultural context nor provided meaningful content. According to Ogodo (2024): “Students are often attracted to what interests them. Therefore, the subject matter must align with learners’ interests or areas of familiarity to stimulate their interests” (p.5). Based on Caleb’s feedback, I concluded that the science curriculum, and perhaps other subjects, lacked cultural relevance and failed to engage him in a way that felt purposeful.

Pedagogy

In its simplest terms, pedagogy refers to a teacher’s teaching style and approach. It is critical to student engagement and learning outcomes, mainly when linked to cultural relevance. A teacher’s ability to integrate cultural references and adapt their teaching style to meet the needs of the students in their classroom can significantly impact learning.

Julian, one of the participants, expressed difficulties in his Geometry class despite his efforts to remain attentive. He explained:

> My least favorite is more than likely Geometry. It was a mix between the course and the person teaching it. Because there were times I didn’t understand, and she would just skip through a whole bunch of the lesson, and I would end up getting lost. And I was paying attention.

Julian’s comment highlights that, while he was willing to engage with the material, the teacher’s pedagogical style hindered his understanding, making Geometry one of his least favorite subjects.

Similarly, Julian faced challenges in Chemistry, which he attributed not to the subject matter but to the teaching style: “My least favorite is Chemistry. I don’t feel like it’s the subject itself; it’s the way the teacher teaches. He cannot explain the material well for me to understand.” These experiences suggest that when pedagogical styles do not align with students’ learning needs, even subjects they might otherwise enjoy or excel in can become sources of frustration.

Numerous studies have examined pedagogical content knowledge (PCK) and its relationship to teachers’ instructional effectiveness (Bock et al., 2024; Fischer et al., 2017). In underrepresented neighborhoods, Black students often lack access to teachers who possess the skills to deliver science content understandably and effectively. Shulman (1986) defined PCK as more than just mastering content; it includes understanding: “the ways of representing and formulating the subject that make it comprehensible to others” (p. 9). With the adoption of new standards in science, such as the Next Generation Science Standards (NGSS), which emphasize crosscutting concepts and disciplinary discourse, it is increasingly essential to ensure teachers are equipped to teach science in ways that students can understand. Morrell et al. (2020) noted that teacher educators are aware of this challenge, stating: “While content knowledge is important for science teachers, most science teacher educators would agree that knowledge of how to teach the content effectively (i.e., pedagogical content knowledge) is also essential” (p. 4). However, some teachers prioritize teaching for grades over fostering deep student understanding. Boda et al. (2019) studied culturally relevant pedagogy with elementary STEM teachers. Their study revealed that although the teachers understood the concept, they could not implement it effectively in their STEM classrooms.

The Impact of Standardized Testing

Julian's experience with a teacher prioritizing understanding demonstrates how some educators oppose the policies, focusing on genuine learning rather than performance indicators. He stated: "Um, no, especially in my current science class, which is climate change and environmental science, um, he does not care about the works getting turned in; it is more about if we understand the material he is giving us." Jalen shared his experiences based on his past and current science teacher. He said:

> Previously, my science class was more so of like grades than more so like understanding what's going on, and even though when he would try to explain it, it was like very, you know, like unclear, but now with my current computer science teacher or multimedia, she makes sure like she even has like office hours, you can even email her during the school hours from like 9 a.m. to 6 p.m. or 7 p.m. She answers any questions you have, and she also makes sure that you understand what's going on in the class so you have a deep understanding of what we're learning. But she also does care about grades at the same time but is more understanding.

Jalen's comparison between past and current teachers highlights how individual teacher approaches can vary within the same system. While one teacher prioritized grades, aligning with a system driven by standardized assessments, another focused on ensuring students understood the material, reflecting a more student-centered approach.

The participants in this study had contrasting experiences with their science teachers who emphasized grades versus understanding. This reflects a broader issue in American education:

prioritizing school performance, such as standardized test scores, and over-understanding the material being taught. Standardized testing has long been a cornerstone of educational accountability in the United States, often putting pressure on how teachers structure their classrooms and decide on the curriculum's pacing (how fast or slow the lessons should be taught) (Guajardo & Salinas, 2022). Schools face significant pressure to meet performance benchmarks, often resulting in a greater emphasis on grades and test preparation rather than fostering deep comprehension and critical thinking. McNeil (2000) observed: "As a result, centralized standardization creates inequities, widening the gap between the education provided to poor and minoritized youth and that to which middle-class children have access" (p. 231). For educators, particularly new teachers who are not yet tenured, a term used by the NYC Department of Education to describe teachers with permanent positions, this focus on test scores can be incredibly challenging. These educators are often held accountable for their student's performance, which may lead to a diluted educational experience for students. Despite these challenges, some teachers prioritize student understanding over grades. This thin line between grades and understanding symbolizes the challenges of minoritized students, particularly in urban schools. These students often encounter educational environments shaped by systemic inequities compounded by elite capture. Those in power control academic policies and resources, perpetuating a system emphasizing performance numbers over equitable access to quality learning experiences.

Critical Consciousness and Educational Gaps in Science Teaching

One of the questions I asked the boys was if it matters to them whether a Black male teacher, a female teacher, or a White male teacher teaches them. Julian, Jalen, and Caleb, stated that the teacher's race or gender does not matter to them as long as the teacher helps them understand the material and meet their academic requirements. Jalen stated:

> I do not care for the gender or the race or skin color as long as they like to help me in the way that I need to be helped or want to be helped, like, cause me, I am more of like a visual learner or a one on one type of like tutoring type of session type of student. So I do not really care for the gender or the race.

Caleb said: "I never thought of it, but it does not really make a difference to me." Julian said: "So, generally it doesn't really matter to me as long as they help the students understand the material, or make sure that we are doing what we're supposed to do, it does not really matter."

I then brought up the Tuskegee syphilis experiment as an example of a potentially sensitive topic, questioning whether their biology teachers felt comfortable addressing it. The boys reveal they have never heard of the experiment. This response suggests that, while students claim not to care about the race or gender of their teacher as long as they understand the material, the issue of who teaches them and what they teach becomes essential. This highlights a disconnect between the students' learning experiences and culturally relevant issues, such as the Tuskegee syphilis experiment, which has significant racial and ethical implications in science.

This lack of awareness was also evident when the participants were asked about barriers they faced in science education, such as access to resources or opportunities. Julian responded: "No, I don't think so." Jalen's response focused on the teacher's ability: "Just the chemistry teacher, he did not make it interesting." Caleb said: "No." How can students recognize educational barriers when they have never experienced anything better? The participants in this study believe that what their school offers is sufficient because they are unaware of what additional resources exist or how those resources could enhance their learning or spark greater interest in science. For example, Caleb mentioned that school is not fun for him and that he is not interested in subjects he does not like. Perhaps his interest and perception of science might differ if his school had more resources, such as those available in the "outlier school" described below. This, of course, is just my opinion/hypothesis.

In this study, I discovered that the students were unaware/ not conscious of specific racial and equity issues, which led to some critical questions: How can you miss something you have never had? How can you claim something would be better if you have never experienced it? These questions were meant to highlight that the participants cannot know whether having more resources or a more culturally relevant curriculum would benefit them because they have never had access to either. The participants are not critically conscious. Clark et al. (2017) describe critical consciousness as: "the ability to recognize and analyze systems of inequity and the commitment to take action against these systems - can be a gateway to academic motivation and achievement for marginalized students" (p.18). Participants should recognize the gaps in their education and the opportunities that other races and social classes have access to, which they are often denied. This disparity reflects the concept of elite capture, where privileged groups shape and control access to resources, including educational opportunities, to maintain their dominance. By understanding what is missing from their education, participants can critically analyze how systemic inequities are perpetuated through the selective distribution of knowledge and resources.

Representation

Although the participants may not be aware of some of the resources available to other school districts as opposed to theirs, they displayed great insights into what they believed an ideal science teacher should possess. The participants' depiction of their ideal science teacher revealed a clear prioritization of qualities such as inclusivity, intelligence, humor, and fairness over racial and gender characteristics. Despite being given colored pencils, the participants did not emphasize the color used to draw the teacher. Instead, they emphasized characteristics of a teacher who could provide equitable opportunities, explain material effectively, and foster a positive, inclusive learning environment. For example, Jalen drew a teacher and added characteristics such as, “intelligent, great explaining skills, understanding, positive, funny, diverse” (see Figure 4.1). Caleb used descriptors such as, “imaginative, following his instinct, and willing to take risks” (see Figure 4.2). This finding suggests that, while representation remains essential, the participants viewed effective teaching practices and classroom dynamics as more critical to their success in science. The participants’ visions highlight the need for structural changes in teaching practices and curriculum design.

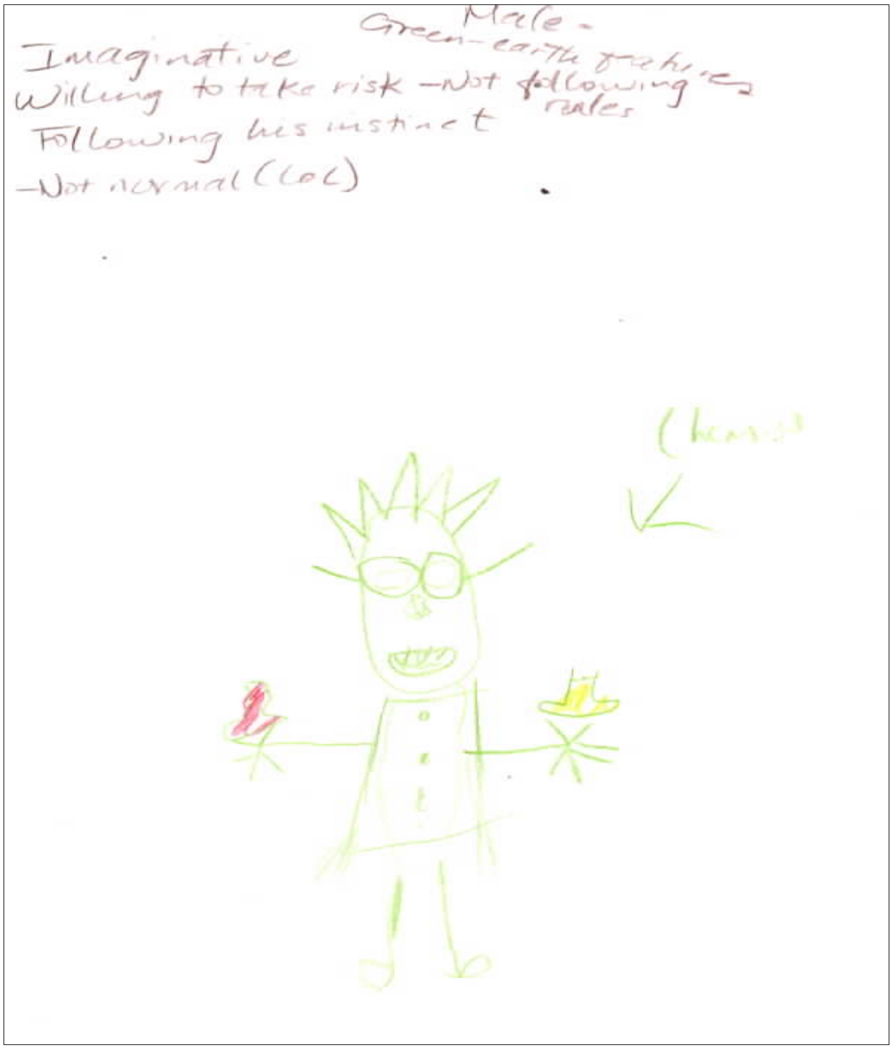
Figure 4.1

Jalen's Drawing of an Ideal Science Teacher

Note. Jalen described his ideal science teacher using the following characteristics; great explaining skills, understanding, open, fun or funny, great listening skills, positive, diverse, and providing equal opportunities for students.

Figure 4.2

Caleb's Drawing of an Ideal Science Teacher



Note. Caleb's ideal science teacher is a Chemist. He described his ideal science teacher using the following characteristics; imaginative and willing to take risks (not following the rules), but following his instinct. Caleb also said his ideal science teacher would not be normal.

Enrollment in Advanced Placement and/or STEM courses

To illustrate Elite Capture in my study, I analyzed data from the schools attended by all three participants. I compared them to a school in a rural neighborhood with a predominantly White and Asian student population, in contrast to the high number of Black and Brown students in the participants' schools. This data was obtained from the New York State Education Department (NYSED) and the various schools' websites. The findings are presented in Table 4.3 below

Table 4.3

Comparison of Racial Composition, Academic Programs, and Extracurricular Offerings at Participants' Schools and an Outlier School

School	Total Students	Gender (M/F)	Race % of total	Science and/or STEM Programs Offered	Math Programs Offered	Science and/or STEM Clubs Offered
School X (Participant #1)	616	Male - 260 Female - 356	American Indian or Alaskan Native - 1% Black or African American - 72% Hispanic or Latino - 13% Asian or Native Hawaiian - 8% White - 4% Multiracial - 1%	-Biology -AP Biology -Chemistry -AP Chemistry -Physics -AP Physics	-Algebra -Calculus -Geometry	None
School Y (Participant #2)	625	Male - 625 Female - 0	American Indian or Alaskan Native - 2% Black or African American - 81% Hispanic or Latino - 13% Asian or Native Hawaiian - 0% White - 1% Multiracial - 3%	-Biology -Earth Science -AP Environmental Science -Computer Science or Chemistry (students had to choose one of the two)	-Algebra -Geometry -Calculus	-Hydroponics -Environmental Sustainability
School Z (Participant #3)	621	Male - 329	American Indian or Alaskan Native - 2%	-Biology -AP Biology -Chemistry	-Algebra -Calculus -Geometry	None

		Female - 292	Black or African American - 74% Hispanic or Latino - 23% Asian or White - 1%	-AP Chemistry -Physics -Environmental Science		
Outlier School	5,940	Male - 3,285 Female - 2,521	American Indian or Alaskan Native - 1% Black or African American - 5% Hispanic or Latino - 7% Asian or Native Hawaiian - 24% White - 60%	-Biology -Chemistry -Computer Science & Engineering -Health -Introduction to Neuroscience -Physics -Environmental Science Major Programs (last two years of high school) -Aerospace -Advanced Health Professions -BioScience -Civil Engineering -Electrical Engineering -Industrial Design -Mechatronics & Robotics -Software Engineering	-Common Core Algebra -Common Core Algebra II -Common Core Geometry -Pre-Calculus -Calculus -AP Calculus -AP Statistics -Multivariable Calculus -Math Research -Linear Algebra	-Chemistry Club -Aerospace Club -AI and Investment Club -AI Club -AP Science Podium -Archaeology Club -Astronomy Club -Bioethics -Biotech Club -Dentistry Club -Pediatric Club -Calligraphy Club -Tech tips Club -Code Works -Competitive Coding Club -Crime Scene Investigation Club -Dermatology Club -Digital Art Club -Food Science Club -Graphic Design Club -Hands on Engineering Club -Math Team Club -Microbiology Club -Physics Club -Science National Honor Society -Science Olympiad -Tech Codes Club

The data highlights elite capture through the significant disparity in STEM opportunities between schools in rural and urban neighborhoods. Schools in rural areas, with predominantly White and Asian student populations, offer a wide range of STEM courses and clubs, providing students with advanced resources and opportunities to excel in STEM fields. In contrast, the urban schools attended by predominantly Black students provide only introductory science courses and have few, if any, STEM-related clubs. This inequity in access to quality STEM education underscores systemic resource allocation favoring privileged groups, limiting opportunities for marginalized communities.

When asked about their knowledge of STEM, the participants provided the following responses: Caleb said: “What is that?” Jalen replied: “No, not really. There is no … there is no real STEM program in our school. But sometimes they will bring in students from colleges like Yale to talk about their college experience.” Julian responded: “I think there is an AP class about that, but I am not really sure. Students have to be selected and have a certain grade in the related classes to get in.” These responses reveal an apparent lack of knowledge about STEM among the participants. Julian’s comment also suggests that if such a program exists, it is only accessible to a select group of students who meet specific criteria. This raises an important question: What does “Science for All” mean? If every student does not have equal access or opportunity to enroll in AP or STEM courses, can science education genuinely be considered inclusive and equitable?

Beyond the content of the science curriculum in schools with a high population of Black and Brown students, the availability or lack of quality courses also carries significant racial and societal implications for science education. This lack of access reflects elite capture, where decisions about resources and curriculum are controlled by those in power, often prioritizing the needs of more privileged groups. How can these boys or students compete with their White peers in a STEM-focused workforce when their schools do not even offer STEM courses? Additionally, they are often denied access to advanced placement science courses, such as Physics or Engineering, further limiting their opportunities.

4.7 Discussion and Implications

This study explored the science education perspectives of three Black boys enrolled in general education programs in different Brooklyn high schools. It examined how curriculum, pedagogy, standardized testing, and access to advanced courses and STEM opportunities shaped their engagement and perceptions. The findings highlight critical issues of cultural relevance, teaching practices, systemic inequities, and Elite Capture in urban education. This discussion situates these findings within broader educational frameworks and offers implications for research, policy, and practice.

Cultural Relevance and Student Engagement

The findings demonstrate the importance of culturally relevant curricula in engaging students and fostering meaningful connections to academic content. Caleb's critique of the perceived lack of real-world applicability in his science courses highlights the disconnect between the curriculum and his lived experiences. This aligns with research highlighting how teaching science in ways that connect to students' everyday experiences actively enhances their learning (Kane, 2015; Warren & Rosebery, 2011). By integrating culturally relevant examples and addressing historical inequities, such as the omission of the Tuskegee syphilis experiment from their education, science education can create opportunities for students to see themselves in the content and develop a deeper understanding of its societal significance. Here, I suggest incorporating Ladson-Billings' (1995) concept of culturally relevant pedagogy. It is crucial to reflect students' culture in the curriculum and provide them with opportunities to critically reflect on and examine what is missing. For example, the science teachers my participants had never discussed the Tuskegee Syphilis Experiment, an important topic that Black boys should be taught about, especially in a science curriculum. They should also be allowed to analyze why it is often excluded from textbooks and mainstream curricula, in line with culturally relevant pedagogy. Schools must prioritize culturally relevant curricula that align with students' identities, histories, and aspirations. Educators' professional development should focus on embedding cultural responsiveness into science instruction and, most importantly, training on talking about "thorny" issues (Alexakos, 2016).

Pedagogical Practices and Student-Centered Learning

The participants' comments on teaching styles reveal the critical role of pedagogy in shaping their learning experiences. Julian and Jalen's experiences with ineffective teaching highlight how inaccessible instruction can alienate students, even in subjects they are motivated to learn. On the other hand, Jalen's appreciation for his multimedia teacher illustrates the impact of student-centered approaches emphasizing understanding alongside academic rigor. These findings echo existing literature, suggesting that teaching practices prioritizing relational engagement and adaptability significantly enhance learning outcomes for minoritized students (Kane, 2015; Warren & Rosebery, 2011). Educators must employ pedagogical strategies prioritizing relational engagement and differentiated instruction. Since the boys are all Basketball players, educators should be able to use this information to engage the students in the classroom. Administrators should also encourage reflective teaching practices and invest in ongoing teacher training to foster effective student-centered pedagogy.

The Role of Standardized Testing in Marginalized Communities

The participants highlighted that the tension between grades and understanding reflects a systemic issue where standardized testing drives educational priorities. While Julian and Jalen valued teachers who prioritized understanding, the broader emphasis on test scores often replaced deep learning. This indicates a more significant systemic issue of elite capture, where policies favor performance numbers over equitable education, disproportionately impacting urban schools with limited resources. Policymakers must reevaluate the role of standardized testing in education, shifting toward assessments that prioritize critical thinking and incorporating students' interests and comprehension over memorization. Alternative assessment methods, such as project-based and hands-on learning, should be explored to provide a more accurate evaluation of student achievement.

Resource Disparities and STEM Access

The significant differences between the participants and outlier schools reveal systemic inequities in access to advanced STEM courses and extracurricular opportunities. The participants' limited awareness of STEM highlights how elite capture perpetuates inequitable resource allocation, creating barriers for marginalized students to compete or succeed in STEM-focused fields. The lack of advanced courses and clubs in urban schools directly contradicts the ideal of "Science for All," further marginalizing students of color. Educational stakeholders must address systemic inequities in resource allocation by advocating for equitable funding and access to advanced STEM opportunities in urban schools. Partnerships with universities and industries can provide students with exposure to STEM fields and resources, helping to bridge the gap.

Awareness of Historical and Structural Inequities

The participants' lack of awareness of racialized historical events, such as the Tuskegee syphilis experiment, underscores significant gaps in their science education. This absence of critical knowledge highlights the importance of integrating discussions of historical and ethical issues into the science curriculum, ensuring students understand the intersections of race, science, and society. Educators should incorporate historical and ethical issues into science curricula to provide students with a comprehensive understanding of the sociopolitical context of science. Curriculum designers should ensure these discussions promote critical thinking and awareness of systemic inequities.

4.8 Broader Implications for Policy and Practice

This study contributes to the growing body of literature on the experiences of Black boys in science education, highlighting the connection between individual contexts and systemic factors. Addressing the issues raised in this research requires a diverse approach: First, policy reforms must aim to dismantle elite capture by promoting equitable resource distribution and reducing the overreliance on standardized testing. Second, teacher education programs must prioritize cultural competence and ways to adapt teaching styles, equipping educators to meet the diverse needs of their students. Third, community partnerships should be nurtured, with collaborations across community organizations, universities, and industries to provide students with resources, mentorship, and exposure to STEM fields. Addressing these systemic barriers can create a more inclusive and equitable science education system that empowers Black boys and other marginalized students to succeed academically and beyond.

4.9 Conclusion

This study explored the science education experiences of three Black boys enrolled in general education programs at different high schools in Brooklyn. Through their narratives, it became evident that systemic inequities and pedagogical and curricular shortcomings significantly shaped their engagement with science and their perceptions of its relevance to their lives. Despite attending schools within the same borough, Caleb, Jalen, and Julian's experiences reflected stark disparities in access to quality resources, culturally relevant curricula, and supportive teaching practices.

One of the key findings revolved around the lack of cultural relevance in the science curriculum. Caleb's observation that much of what he learned in school did not resonate with his real-world needs underscores a disconnect between students' lived experiences and the content they are taught. This misalignment suggests that science education often fails to contextualize learning within students' cultural and social realities, ultimately limiting its impact and relevance. When science curricula neglect to integrate culturally meaningful content, they risk alienating students and diminishing their interest in the subject.

Pedagogy also emerged as an important factor influencing student engagement. Julian's struggles in Geometry and Chemistry, attributed to his teachers' ineffective teaching styles, highlight the importance of responsive and adaptive instructional methods. Conversely, Jalen's positive experiences with a teacher who prioritized understanding over grades demonstrated the transformative potential of student-centered pedagogy. These contrasting accounts illustrate that effective teaching is not merely about delivering content but also about fostering an environment where students feel supported, understood, and capable of achieving academic success.

Another significant theme was the tension between grades and understanding, exacerbated by the emphasis on standardized testing. While some teachers resisted this pressure by prioritizing comprehension, the broader systemic focus on test performance often dictated classroom practices. This systemic prioritization reflects elite capture, where decision-makers uphold policies prioritizing measurable outcomes over equitable, meaningful learning experiences. For marginalized students, this often translates into limited opportunities for intellectual growth and critical engagement with the material.

The study also uncovered troubling gaps in students' awareness of racial and ethical issues in science, such as the Tuskegee syphilis experiment. The participants' lack of knowledge in this area underscores a broader failure of the education system to address historically significant and culturally relevant topics. This omission perpetuates educational inequities and deprives students of the opportunity to engage critically with the societal implications of science.

Furthermore, disparities in access to STEM and advanced placement courses revealed systemic inequities in resource allocation. The comparison between the participants' schools and a predominantly White and Asian school in a rural area illuminated the stark contrast in opportunities available to students based on their racial and socioeconomic backgrounds. The participants' limited awareness of STEM further highlighted the exclusionary nature of these programs, raising questions about the inclusivity of science education. How can students aspire to pursue STEM fields when unaware of what they entail or lack access to foundational opportunities?

This study's findings underscore the urgent need for systemic changes in science education. Schools must prioritize culturally relevant curricula, equitable resource access, and pedagogical practices that center student understanding and engagement. Addressing these gaps is a matter of educational equity and a step toward empowering marginalized students to see themselves as active participants in science and society. Without such reforms, the promise of "Science for All" will remain unfulfilled, further entrenching disparities and limiting opportunities for students like Caleb, Jalen, and Julian.

Chapter 5: Navigating Science Education: Insights from Special Education Participants

Abstract

This study explored the overrepresentation of Black boys in special education and their underrepresentation in Science, Technology, Engineering, and Mathematics (STEM) fields, using Disability Critical Race Theory (Dis/Crit) and Elite Capture as the theoretical frameworks. The research involved two high school male students, two special education teachers, and one parent of a special education student. The findings revealed significant disparities in the experiences of Black boys in special education science classes, including limited access to Advanced Placement (AP) courses, a lack of STEM opportunities, and the influence of teacher expectations on academic outcomes. These findings highlighted the systemic barriers that Black boys in special education face, underscoring the need for policy reform regarding the placement of students in special education and the opportunities provided to them once placed. The study calls for a reevaluation of how educational structures and practices contribute to the inequitable educational experiences of Black boys in special education, particularly in the context of STEM education.

Keywords: Black Boys, Special Education, Dis/Crit, STEM, Educational Structures, Policies

5.1 Introduction

The underrepresentation of Black male students in science, technology, engineering, and mathematics (STEM) has been a persistent issue in recent decades. The *State of U.S. Science and Engineering* (2022) reports that: “Blacks and Hispanics are underrepresented among students earning S&E degrees and among STEM workers with at least a bachelor’s degree” (p. 2), highlighting the ongoing barriers faced by these groups in accessing and advancing in STEM fields. Compounding this issue is the overrepresentation of Black boys in special education, which creates additional obstacles to accessing the foundational STEM education necessary for postsecondary success (Bal et al., 2013; Chiu & Delahunty, 2021). Research shows that the educational experiences of Black and Hispanic students in elementary and secondary school play a critical role in shaping their decisions about pursuing STEM in higher education.

Elementary and secondary education in mathematics and science serves as the foundation for pursuing postsecondary STEM majors and STEM-related careers, as noted in *The State of U.S. Science and Engineering* (2022): “Elementary and secondary education in mathematics and science is the foundation for entry into postsecondary STEM majors and STEM-related occupations” (p. 5). This foundational period not only equips students with the essential knowledge and skills but also fosters their interest and confidence in STEM disciplines. Early exposure to engaging and practical science and mathematics education can inspire students to explore advanced courses, such as AP STEM subjects, and participate in STEM-related extracurricular activities. Davis et al. (2022) reinforced this point, emphasizing that middle and high school experiences often determine students’ STEM career aspirations:

> Middle and high schools, especially, are the entryway to STEM careers. Access to advanced math courses in middle school gives students the prerequisites for AP

> STEM courses like AP Biology, AP Physics, and AP Chemistry. And students who are exposed to more rigorous classes, including AP classes, are more likely to choose STEM careers. More than half of STEM college majors said they decided on their major before they left high school. (p.8)

Addressing these gaps during elementary, middle, and secondary education is critical to ensuring that Black boys can successfully transition into STEM majors and careers, ultimately contributing to the diversification of STEM industries.

A deeper examination of the experiences of Black boys throughout elementary, middle, and secondary education is essential to identifying the factors contributing to their underrepresentation in STEM careers. Research also highlighted that students' success and interest in high school science strongly influence their decision to pursue science in college and beyond (Hoogstra & Shernoff, 2001; Maltese & Tai, 2011; Wang, 2013). These findings emphasize the importance of examining Black boys' high school science experiences, particularly those in special education, to better understand the factors contributing to their continued underrepresentation in STEM fields. For this study, special education students are defined as students who may have physical or mental disabilities requiring additional resources or accommodations to achieve academic success. Black boys in special education programs are often limited in their access to advanced courses, such as those in STEM, further diminishing their opportunities to build a strong academic foundation. add sources

Children in special education programs are referred to as "children with disabilities" under the Individuals with Disabilities Education Act (IDEA), which defines them as individuals with:

1. intellectual disabilities

2. hearing impairments (including deafness)
3. speech or language impairments
4. visual impairments (including blindness)
5. serious emotional disturbance
6. orthopedic impairments
7. Autism
8. traumatic brain injury
9. other health impairments
10. Or (i) specific learning disabilities; and (ii) who, by reason thereof, need special education and related services.

Historically, children with disabilities lacked protections ensuring access to education until the Education for All Handicapped Children Act (EHA) in 1975. A primary goal of EHA was: "to assure that all children with disabilities have available to them…a free appropriate public education which emphasizes special education and related services designed to meet their unique needs" (Individuals with Disabilities Education Act, para. 1). Renamed the Individuals with Disabilities Education Act (IDEA) in 1990, this shift also reflected societal changes, replacing terms like "handicapped" with "disabled" to foster cultural sensitivity. According to Devlieger (1999): "By moving the person to the forefront in the 'person with disability' expression, the possibility of real problems has been diminished. The problem is characterized as no longer in the person but in the environment" (p. 348). By using 'person with a disability,' the fault for not being academically successful does not lie on the children. The environment must be adapted to meet their individual needs to ensure their academic success.

The Centers for Disease Control and Prevention (2023) defines disability as: "any condition of the body or mind (impairment) that makes it more difficult for the person with the condition to perform certain activities and engage with the world around them" (para.1). This study focused on special education categories related to cognitive impairments rather than physical impairments due to the disproportionately high number of minoritized children in the U.S. who fall under these classifications. Losen and Orfield (2002) reported that: "In 1998, approximately 1.5 million minority children were identified as having mental retardation, emotional disturbance, or a specific learning disability" (p. xix). Meanwhile, the National Center for Education Statistics noted that: "in 1998, there were 46.5 million students enrolled in public elementary and secondary schools across the 50 states and the District of Columbia" (p. 1). This highlights the disproportionate representation of minoritized children in special education.

Intellectual disability is defined as: "significantly below-average intellectual functioning, occurring alongside deficits in adaptive behavior, and appearing during the developmental period, negatively impacting a child's educational performance" (National Dissemination Center for Children with Disabilities). Emotional disturbance, as described by the same source, includes traits such as:

(a) Difficulty learning without identifiable intellectual, sensory, or health-related causes.

(b) Challenges in forming or maintaining positive relationships with peers and teachers.

(c) Displaying inappropriate behaviors or emotions in typical situations.

(d) Consistent feelings of sadness or depression.

(e) Developing physical symptoms or fears related to personal or school-related issues.

This study specifically sought to explore the connection between the overrepresentation of Black boys in special education and their underrepresentation in STEM fields. While numerous studies have addressed the underrepresentation of Black and Hispanic students in STEM (Bottia et al., 2021; Neally, 2023), there is a significant gap in research focusing on Black boys in special education and how their educational experiences impact their access to and participation in STEM pathways. This focus is substantial given the broader issue of male underrepresentation in STEM majors and careers, highlighting the need for targeted investigations into these intersecting disparities.

5.2 Literature Review

This literature review examined the intersection of Critical Race Theory (CRT) and Disability Studies through the lens of Dis/ability Critical Race Theory (DisCrit). This framework explores how race and disability intersect to shape the educational experiences of minoritized students. DisCrit builds upon CRT by emphasizing how the social construction of disability interacts with systems of racial injustice, providing a critical perspective on how both race and disability contribute to inequities in education. Elite Capture complements this framework by analyzing how resources and opportunities are frequently seized by dominant groups (the elites), thereby reinforcing systemic inequities and restricting access for marginalized communities. In conjunction with DisCrit, Elite Capture offered a roadmap for understanding the science education experiences of African American males in special education, shedding light on the structural barriers they face.

The review begins by exploring the history of education in the United States, highlighting how systemic inequalities have shaped access to and experiences within the educational system, particularly for Black students. It then connects this historical context to the literature on special education, examining how Black boys are disproportionately categorized in special education programs. The review concludes by focusing on the specific experiences of Black boys in science education, particularly those in special education, to highlight the compounded barriers they face within both racial and disability-based educational contexts.

History of Schooling in the United States

The history of schooling in the United States has long been intertwined with systems of inequity, particularly in its treatment of African Americans. During the era of slavery, education was deliberately withheld from enslaved people. According to Anderson (1989): " … Virginia in 1787, Jefferson proposed a popular educational system that would offer three years of public schooling to every white child of the commonwealth and then send the brightest male youngsters on to grammar school and college…" (p.1). There were no provisions for any Black children to attain an education, and Anderson (1989) noted that enslaved children comprised 40% of Virginia's total child population at the time. This deliberate denial of education was rooted in the understanding that knowledge empowers individuals because the enslaved people, "... viewed literacy and formal education as means to liberation and freedom" (Anderson, 1989, p.17). The efforts to prevent enslaved children from attaining an education went as far as legislation.

Laws were enacted to prohibit enslaved children from learning to read or write, and any attempts at education were often met with severe and brutal punishments. According to Anderson (1989): "As former slave William Henry Heard recalled: 'We did not learn to read nor write, as it was against the law for any person to teach any slave to read; and any slave caught writing suffered the penalty of having his forefinger cut from his right hand….'" (p.16). Any educational attempts had to be done discreetly to avoid being caught and punished. Anderson (1989) recalled: "Thomas H. Jones, a slave in mid-nineteenth-century North Carolina, learned how to read while hiding in the back of his master's store" (p.16). These harsh restrictions persisted until the abolition of slavery, after which systemic efforts continued to limit the quality of education available to African Americans.

Even after the abolition of slavery and the growing recognition that education could no longer be entirely denied to Black Americans, systemic efforts continued to undermine the quality of education accessible to them. These efforts were formalized through laws and court rulings to maintain racial inequities. The *Plessy v. Ferguson* decision of 1896 established the doctrine of “separate but equal,” legally sanctioning the segregation of Black children in schools that were often underfunded and poorly resourced compared to those for White children. Historians have documented the conditions of schools attended by Black children during this period. Anderson (1989) cited Clinton J. Calloway, who described one of the schools in Alabama as, “an old shanty belonging to one of the planters which was used to house the school children and their one teacher” (p.157). Similarly, Richard Wright noted: “Sometimes there is a weather-worn, pine-built schoolhouse for our children” (Anderson, 1989, p.149). The buildings used to house the children were deplorable and overcrowded, with just one teacher. There was nothing equal about the *Plessy v. Ferguson* decision of 1896.

This ruling institutionalized a dual education system that deliberately perpetuated disparities in access to quality education. Decades later, the landmark *Brown v. Board of Education* decision in 1954 overturned *Plessy*, declaring that “separate but equal” was inherently unequal and mandating the desegregation of schools. While this ruling was a significant legal victory, its implementation was met with widespread resistance. Many states employed new strategies to circumvent integration, such as creating private schools for White students, manipulating zoning laws, or underfunding public schools in predominantly Black neighborhoods. These tactics demonstrated the lengths the system would go to maintain educational inequities. The end of explicit segregation marked the beginning of more covert forms of discrimination, ensuring that African Americans continued to face significant barriers to equal education.

The Origin of Special Education

DePoy and Gilson (2011) presented a history of the term disability based on their analysis of texts and images on this topic. In the 1500s, disability was formally referred to as handicap, a term coined by Henry VII after soldiers' injuries incurred during the war. This term was used up to the early 20th century in medicine to describe persons with bodily differences that did not allow them to participate in everyday activities without assistance. Also, in the 20th century, we experienced a change in the term handicap to a more desirable and respectable term, disability.

Before the 20th century, people with disabilities experienced segregation in education. Separate institutions were explicitly erected for them. Education for students with disabilities was not inclusive, and some were even refused a formal education. In the mid-20th century, special education was developed to reflect a more inclusive approach to educating students with diverse needs. Between the 1950s and 1970s, the United States of America saw significant historical events that encompassed this inclusivity. *Brown V. Board of Education 1954* addressed racial segregation in public schools across the United States. This policy set the groundwork for the Civil Rights Act of 1954, the Individuals with Disabilities Education Act of 1975, and No Child Left Behind 2002. These policies mandated that students with disabilities receive equal and inclusive educational opportunities (Katsiyannis et al., 2017). However, their implementation also coincided with a notable increase in the representation of African Americans in special education programs, raising questions about equity and bias within the system.

Data retrieved from the Individuals with Disabilities Education Act comparing the number of African American students with disabilities in America compared to other races showed that African American children were being placed in special education categories at a higher rate than other races. Of this large percentage of Black students overly represented in special education, a large percentage are boys. Woods Jr. (2023) states: “Overall, African American boys are 40% more likely to be placed in special education than their peers and twice as likely to be assigned Emotional Disturbance” (p.264). This designation of special education has led to several challenges faced by Black boys in schools. These challenges are deeply intertwined with systemic inequities, as reflected in their overrepresentation in special education programs.

The following literature explores these issues, providing an overview of the obstacles Black boys face in public schools and their limited opportunities. It begins by addressing the disproportionate representation of Black boys in special education. Next, it examines the impact of systemic racism in schools, particularly its role in perpetuating the school-to-prison pipeline. The discussion also highlights the underrepresentation of Black boys in gifted programs, their limited access to Advanced Placement (AP) and honors courses, and their exclusion from STEM programs. These disparities underscore the inequitable opportunities provided to Black boys compared to their White peers. Additionally, the literature explores funding inequities, biases in standardized testing, a lack of social-emotional support, implicit bias in disciplinary practices, and the harmful effects of zero-tolerance policies.

Disproportionate Representation of Black Boys in Special Education

The Individuals with Disabilities Education Act (IDEA) was designed to support students with disabilities by ensuring they receive the resources and accommodations necessary for academic success. Additionally, IDEA includes “policies and procedures designed to prevent the inappropriate overidentification or disproportionate representation by race and ethnicity of children with disabilities.” For this study, I use the definition of disproportionate representation provided by Best et al. (1999), who defines it as “the extent to which membership in a given ethnic group affects the probability of being placed in a specific special education disability category” (p. 198). A summary of data from the 2022-2023 school year (see Table 5.1) illustrates the percentage of students in special education programs, focusing on the representation of Black students within that group.

Table 5.1

Enrollment and IDEA Student Data (2022-2023)

Category	Number of Students (in millions)	Percentage (%)
Total Prek-12 Enrollment in Public Schools	49.6	100
PreK-8 Enrollment	34.1	68.8
Grades 9-12 Enrollment	15.5	31.2
Students serviced by IDEA (Grades 3-12)	7.5	15.1 of total Prek-12
Black students serviced by IDEA (Grades 3-12)	1.275	17 of IDEA students

The data reveals a significant number of Black students served under IDEA. As Losen and Orfield (2002) observed, a substantial number of minoritized children, about 1.5 million, were diagnosed with mental retardation, emotional disturbance, or specific learning disabilities.

Among them, over 876,000 were Black or Native American. Notably, Black students were identified with mental retardation at nearly three times the rate of their White counterparts.

The 2022-2023 school year data demonstrate that not much has changed since 1998. Despite IDEA's policies aimed at addressing disproportionality, disparities persist. Why? The disability categories mentioned above are highly subjective and not diagnosed by medical professionals. Teachers or school administrators can recommend students for testing, which may result in their placement in one of these categories. Blanchett (2006) described these classifications as high-incidence diagnoses, noting their pervasive impact:

> These high-incidence diagnoses typically are made by school personnel after the child has started school, re-lying on a subjective referral and eligibility determination process that varies from district to district and from school to school within the same district. Because the judgments in high-incidence categories are subjective and can vary greatly across settings and professionals, misdiagnoses and disproportionality occur more often in those categories than in the low-incidence disability categories. Low-incidence disability categories (e.g., severe or multiple dis- abilities, deaf or hard of hearing, deaf/blindness) typically involve medical personnel and have more clearly defined eligibility criteria and methods of diagnosis. (pp. 24-25)

The data does not indicate the percentage of boys versus girls. The disproportionality in special education placements highlights a systemic pattern of inequity that significantly affects Black boys, particularly in their educational experiences.

Black Male Experiences in Special Education

Black boys in special education face the challenge of navigating systemic barriers associated with both their racial identity and dis/ability label. Historically, they have been stereotyped as underachievers and behaviorally problematic, perceptions often rooted in biased assessment practices and systemic inequities in education (Connor & Ferri, 2005; Ford et al., 2018). These stereotypes also shape how educators interact with Black boys across all their classes.

Black boys in special education often face the challenge of low teacher expectations (Connor & Ferri, 2005; Ford et al., 2018; Proffitt, 2022). Teachers frequently perceive them as incapable of high academic achievement, leading to reduced expectations for the quality of their work. As a result, these boys are often ignored, dismissed, or met with doubt about their abilities. This treatment, stemming from their dis/ability label, can leave students feeling hopeless and, in some cases, cause them to disengage from their education altogether.

This cycle of low expectations and poor treatment often results in academic disengagement, with many Black boys in special education becoming entirely disconnected from their learning. Consequently, they are frequently removed from mainstream classrooms and placed in pull-out settings, limiting their access to the rigorous curriculum offered to their peers. In some instances, they also miss out on receiving the individualized services essential for their success, compounding their daily challenges (Connor & Ferri, 2005; Proffitt, 2022). Over time, these students are often directed toward vocational schools instead of traditional academic programs due to their low academic performance, perpetuating the belief that they cannot excel academically (Farkas et al., 2010). Repeated explicit and implicit messaging reinforces their underachiever label, negatively affecting their self-esteem and creating a cycle of low academic achievement and limited opportunities (Brown, 2011; Hume et al., 2010; Marsh & Noguera, 2018).

The statistics for Black boys in special education remain troublingly consistent. Black male students in special education face disproportionately higher suspension and expulsion rates compared to their White peers (Ford et al., 2018; Losen & Martinez, 2013; Proffitt, 2022). In many cases, schools escalate disciplinary actions by involving law enforcement, criminalizing these boys for minor infractions. Black boys are significantly more likely to be arrested at school than their White counterparts, contributing to the perpetuation of the school-to-prison pipeline (Ford et al., 2018; Losen & Martinez, 2013; Proffitt, 2022). Data from the U.S. Department of Education Office for Civil Rights illustrates this disparity:

- Black students accounted for 15% of total K-12 enrollment but made up 18% of those referred to law enforcement and 22% of students subjected to school-related arrests.
- In contrast, White students represented 46% of total K-12 enrollment, 55% of those referred to law enforcement, and 47% of students subjected to school-related arrests.

This disproportionate disciplinary treatment not only contributes to the criminalization of Black boys in special education but also limits their access to educational opportunities that could foster their academic growth. One notable consequence is their significant underrepresentation in advanced placement (AP) courses and other academically rigorous programs. Despite their potential, these boys are often excluded from such opportunities due to systemic biases, low teacher expectations, and the stigmas associated with their special education labels. This exclusion perpetuates educational inequities and denies them the chance to challenge themselves and develop the skills needed for success in higher education and beyond.

Advanced Academic Placements

Black students are disproportionately placed in special education and face significant barriers to accessing gifted and talented programs, Advanced Placement (AP) courses, and

STEM opportunities. Ford (1998) highlighted this disparity, stating that: "...the 1992 OCR report indicated that schools reported 25,077,421 students enrolled in the nation's public schools. …21.1% were African American, and 60% were White. …1,412,011 students were identified as gifted (5.7%)...12.1% were African American, and 72.4% were White" (p.5). This persistent issue has remained a critical challenge in the U.S. education system for decades, especially for Black students often identified as culturally and linguistically diverse (CLD) (Ford et al., 2008).

Among the underrepresented Black students in gifted programs, a significant percentage are Black males (Ford et al., 2008). The U.S. Department of Education Civil Rights Data Collection (CRDC) reported that during the 2020–2021 school year, 2,955,610 students were enrolled in public schools across all 50 states, the District of Columbia, and Puerto Rico. Of these, 1,493,582 were males, including 108,380 (7.26%) Black males and 859,261 (57.53%) White males. This disparity extends to advanced academic programs, such as AP courses, where Black males continue to be disproportionately excluded, limiting their opportunities to realize their full academic potential.

From kindergarten through high school, a system of sorting and tracking in the U.S. has perpetuated disparities, leaving minoritized groups, particularly African American, Latino, and Native American students, at a disadvantage when it comes to accessing educational opportunities (Darling-Hammond, 2010; Oakes, 1990). Schools serving these groups are often "bottom heavy," meaning they offer fewer academic and college preparatory courses while providing more remedial and vocational courses designed for low-status occupations like cosmetology and sewing (Darling-Hammond, 2010, p. 52). This inequitable distribution of resources has contributed to the persistent achievement gap between Black students and their White peers.

In an era where Science, Technology, Engineering, and Mathematics (STEM) careers are growing rapidly, one might expect equal representation of African Americans alongside their White counterparts. However, due to sorting and tracking practices, this is not the case. Ladson-Billings (2006) raises an important question: "How can we explain the declining performance in mathematics and science at the same time that science and mathematics knowledge is exploding?" (p.3). While knowledge in these fields advances rapidly, minoritized groups are not provided equal opportunities to access it. Ladson-Billings (2006) frames this achievement gap as an "education debt," referring to the historical and ongoing lack of opportunities and resources for African Americans, which traces back to the era of slavery and continues through systemic policies that hinder their access to equal educational opportunities.

The 1983 report *A Nation at Risk*, published by the U.S. Department of Education, highlighted concerns that the U.S. was falling behind other countries in producing academically competent individuals in fields like mathematics, science, and technology. The National Commission on Excellence in Education attributed this decline to the quality of education in schools, overlooking the inequitable distribution of resources across race, class, and gender. In response, the No Child Left Behind Act of 2001 aimed to improve student achievement through high-stakes standardized testing. However, this policy imposed a "one-size-fits-all" approach, which disadvantaged many minoritized students who lacked the preparation and resources to succeed.

For Black boys in special education, access to educational equity remains a persistent challenge due to systemic policies and practices that often exclude or marginalize them. Further research is needed to explore the reliance on standardized testing, particularly in policies like No Child Left Behind, and its disproportionate impact on Black boys in special education. These assessments often fail to consider diverse learning needs, cultural differences, and the unequal distribution of resources. As a result, Black boys in special education face compounded disadvantages, such as biased referral processes, limited access to individualized support, and fewer opportunities to participate in rigorous STEM curricula.

5.3 Theoretical Framework

To better understand the systemic challenges faced by Black boys in special education, I drew on the theoretical frameworks of Dis/ability Critical Race Theory (DisCrit) and Elite Capture. DisCrit merges two critical perspectives, Disability Studies and Critical Race Theory, offering a lens through which we can examine how race and disability intersect to shape marginalized students' educational experiences. DisCrit challenges traditional frameworks that separate race and disability, instead emphasizing how these identities are interconnected and often result in compounded forms of discrimination and exclusion (Annamma, Connor, & Ferri, 2013).

Although significant progress has been made since *Brown v. Board of Education* (1954), racism continues to persist within our educational system in 2023. Society often places individuals into categories based on race, influencing how they are perceived in both schools and communities. Ladson-Billings (1998) states: "Conceptual categories like 'school achievement,' 'middle classness,' 'maleness,' 'beauty,' 'intelligence,' and 'science' become normative categories of whiteness, while categories like 'gangs,' 'welfare recipients,' 'basketball players,' and the 'underclass' become the marginalized and de-legitimated categories of blackness" (p.9). A deeper analysis of these categories reveals that negative moral attributes are disproportionately associated with Blackness. I propose adding a new category to Ladson-Billings' list: special education. I believe that Black students are often misrepresented within this category, particularly Black male students. Once they are placed in special education, the opportunities they receive are limited compared to those of students in general education. This continuous cycle has become normalized in the education system in the U.S.

Critical race theory (CRT) critiques the "normals" embedded in our educational system. As Ladson-Billings (1998) notes: "In response, much of the scholarship of CRT focuses on the role of 'voice' in bringing additional power to the legal discourses of racial injustice" (p.13). Integrating dis/ability into critical race theory (DisCrit) adds a layer to understanding these dynamics. According to Annamma et al. (2013), one of DisCrit's key goals is to spotlight the overrepresentation of Black and other marginalized groups in special education. This overrepresentation, particularly among Black male students: "reinforces the racial hierarchies the US subscribes to" (Annamma et al., 2013, p.8). Because of this dis/ability label, Black male students often face harsher punishments and greater segregation in schools. DisCrit brings attention to the oppression, injustices, and inequities in education that Black and other marginalized groups encounter (Annamma et al., 2018; Annamma & Handy, 2021).

Similarly, anti-Blackness highlights the inequities Black students and other marginalized groups face in education. In predominantly White classrooms, Black students often feel compelled to remain silent, fearing that expressing themselves will be perceived as "too Black." Their Blackness is seen as something to be scorned or feared, especially when White teachers hold biased views and interpret their attempts to speak out against injustices as aggressive or rude (Brooks & Martin, 2022; McGee & Pearman II, 2022).

The application of DisCrit to examine the placement of African American boys in special education can highlight necessary changes to help them succeed in science. A deeper understanding of Black boys and their cultural experiences could lead to fewer referrals for special education placements. Instead, more attention would be given to curriculum, pedagogy, and how and what science is taught. This shift could result in improved science outcomes for Black boys.

Building on the importance of understanding the cultural and educational needs of Black boys, it is also crucial to consider how systemic structures, such as elite capture, influence their educational experiences. Elite Capture, as a theoretical framework, explains the underrepresentation of special education boys in STEM and AP courses by highlighting how dominant groups systematically appropriate resources and opportunities, typically those with more privilege and power (Taiwo, 2022; Dutta, 2009). This manifests in how high-level academic opportunities, such as AP courses and STEM programs, are often reserved for students who meet specific academic criteria, excluding those in special education.

5.4 Purpose

The main objective of this study was to explore the relationship between African American boys in special education and their science learning experiences. The questions below guided this study:

1. How do African American male high school students in special education view their experiences in science education?
2. Do their experiences influence their level of engagement and achievement in science?

These questions are crucial given the underrepresentation of African Americans in STEM fields and male students in special education (Note: Chapter 4 focused on male students in general education). To address this issue, educators, parents, stakeholders, and policymakers need to understand the perspectives of African American male students in special education regarding the quality of science education they are receiving, whether their experiences are positive or negative. Understanding how these students perceive their learning can provide valuable insights that can influence future teaching practices in science education (Akdemir & Gurleyik, 2018; Murcia, 2013). Furthermore, the courses that special education students have access to are often limited compared to general education students, particularly in Advanced Placement (AP) courses, which significantly impact their exposure to rigorous STEM content. This limited access further contributes to the underrepresentation of Black boys in STEM fields. More studies are needed to explore the implications of this restricted access and how it influences their academic trajectories and future participation in STEM.

5.5 Methods

This study highlighted the strengths of qualitative research in exploring complex issues, such as the science experiences of Black boys in special education in high school. Such research is particularly suited to understanding the meanings individuals or groups assign to social problems, aligning with my goal of uncovering my participants' more profound, lived experiences. The use of qualitative methods offered a rich opportunity to deeply explore the experiences of African American males in science, including their perspectives, emotions, motivations, and challenges. This approach provided a platform for African American males to share their stories in their own words, which is especially important for marginalized groups whose voices are often overlooked in quantitative research. In this study, it was essential to emphasize the participants' views on their science experiences, as these formed the core of the research. As Merriam and Grenier (2019) stated: "Qualitative researchers are interested in knowing how people understand and experience their world at a particular point in time and in a particular context" (p. 4). Additionally, qualitative data gathered through interviews and other artifacts captures the complexities of African American males' experiences, nuances that quantitative data often misses.

Further research by Creswell and Poth (2018) of four qualitative research books revealed the following common characteristics, which I also employed in this study:

1. Natural setting: I interviewed the participants in their basketball community. This gained me their trust and a richer understanding of the cultural and environmental factors that influence their science education.
2. Researcher as key instrument - I was the only researcher in this study. I conducted all interviews.
3. Multiple Methods - There was no single data source. I conducted one-on-one interviews and group interviews.
4. I used complex reasoning through inductive and deductive logic to identify common themes. I built the themes by continuously checking the data.
5. Participants' multiple perspectives and meanings - Focus was placed on the participants' experiences and the meanings they gave for those experiences. I did not interject my meaning or interpretations to the participants.
6. Emergent design: I approached this study expecting the research plan to change precisely what happened. Questions and participants changed along the way.
7. Reflexivity - I positioned myself in the study, giving background context to the study choice.
8. Holistic account - I reported the larger picture that evolved from the study and reported more than the cause and effect.

Qualitative research is crucial for addressing social issues and amplifying the voices of marginalized groups.

This study highlighted the problem of educational inequity and offered Black boys, two special education teachers, and a parent a platform to share their perspectives.

Narrative Approach

This study employed a narrative approach, as previously mentioned in Chapter 3. Clandinin and Connelly (1990) asserted: "Narrative and life go together, and so the principal attention of narrative as method is its capacity to render life experiences, both personal and social, in relevant and meaningful ways" (p.10). Although interviews have origins tracing back to the ancient Greeks, it was: "during the latter part of the 19th century [that] researchers began to use interviews to generate information for scientific studies" (Roulston, 2024, p.318). My participants shared deeply personal and meaningful insights into their science schooling, teaching, and parenting experiences through interviews.

Keats (2009) underscored the value of participants' stories in narrative research, emphasizing how such approaches deepen understanding and foster new insights. These boys' stories provided valuable insights into their daily interactions with science, their teachers, and the broader educational system. Additionally, their narratives shed light on their lives as basketball players and the dynamics of being part of a team. Storytelling was a fundamental way for people to make sense of their experiences and create coherence (Polkinghorne, 1995).

Research Setting and Participants

My study included two African American male high school students, all in grades 9-12 and aged 15 to 17, enrolled in special education programs. Two participants were special education teachers at a high school in East Brooklyn, and the final participant was the parent of one of the boys in special education.

The two high school students were interviewed during July and August 2024 during their enrollment at a summer basketball program. The program was held at a basketball court in East Brooklyn from Monday to Friday. The team occasionally traveled for basketball games. I met, recruited, and interviewed the participants at their practice location. The interviews took place after practice at a private location, away from passersby, to ensure privacy.

I purposefully chose a basketball summer program for my study because it offered more than ease of access to participants. It opened me up to spaces where Black boys often navigate complex, intrinsic strategies, requiring teamwork, critical thinking, and adaptability, skills that directly connect to scientific inquiry and problem-solving. My decision to choose basketball was rooted in this very tension: the disconnection between the passions of Black boys and the academic world that too often excludes or ignores them. Ladson-Billings (1998) identified "basketball players" as one of the limiting categories usually assigned to Black boys, an identity that, while seemingly aspirational, is deeply rooted in racialized expectations. Basketball, often viewed as a "Black sport," is simultaneously revered for its cultural significance and scorned for its association with Black masculinity. This paradox reveals a troubling pattern: when Black people excel in a space, that space is devalued or treated as inferior. Success in basketball, for example, is often framed as evidence of physical prowess rather than intellectual or strategic capability. To be a Black basketball player, then, is to be caught in a double bind, celebrated for skill but dismissed in terms of broader societal value. The implication becomes that to choose or excel in basketball is to somehow accept a lesser status, particularly in comparison to the intellectual pursuits that are still associated with whiteness.

This framing matters because it affects how Black boys see themselves and the possibilities available to them. My decision to use a basketball program to recruit participants for this study was not accidental. It was a deliberate effort to engage a population that is often visible in schools but rarely heard in academic or scientific conversations. I wanted to challenge the notion that Black boys who love basketball are not capable of deep, critical engagement with science. Their athletic identity should not overshadow or exclude their intellectual potential. By situating this study within a basketball context, I aimed to disrupt the binary that sees Black athletic excellence as separate from or inferior to academic success.

I explored the barriers that prevented Black boys, especially those in special education, from seeing science as something they can own and enjoy. An Afro-centric framework allowed me to center their lived experiences, recognize their cultural values, and reclaim science education as a space where they, too, can thrive, not just as consumers of culture but as creators, thinkers, and innovators.

The special education teachers were recruited from the high school where I currently teach, located in an urban, underserved neighborhood in East Brooklyn. After working hours, each teacher participated in a 60-minute interview at a park near the school. Although these special education teachers were not teachers of the special education participants in this study, I believe their expertise in the systemic challenges, instructional practices, and institutional barriers that shape the experiences of African American male students in special education was influential in this study. While they may not directly teach the boys in your study, their perspectives provided a broader understanding of how special education policies and practices influence student engagement, access, and success in science education. Additionally, these teachers offered insights into common biases, structural inequities, and resource limitations that impact special education students, particularly Black boys. Their input helped contextualize the students' experiences within the larger framework of special education, highlighting systemic patterns that may not be fully captured through student perspectives alone. By including their voices, this study can offer a more comprehensive analysis of the intersection between race, disability, and science education.

Lastly, Ms. Jane the parent of Jamal, was interviewed via Zoom for 60 minutes at a date and time of her convenience. Including a parent's perspective provided valuable context about the influence of home and community on education. These diverse viewpoints helped create a more comprehensive understanding of the factors shaping the boys' educational experiences. The insights gained from these participants underscored the appropriation of resources by elites, resulting in marginalized groups being deprived, a phenomenon known as elite capture.

Data Sources

After selecting participants and obtaining signed consent forms, data collection was conducted through semi-structured interviews (See Appendix A for questions) lasting 45 minutes each. These interviews took place in person but were recorded via Zoom to ensure accurate transcription. Open-ended questions were used to encourage participants to share their personal experiences in depth. Additionally, during the first interview, the boys were asked to draw their ideal science teacher.

For the second round of interviews, a 45-minute focus group (See Appendix C for questions) was held with the special education boys, though these sessions were conducted remotely, with each participant joining from home. Special education teachers were interviewed in person (See Appendix D for questions), with Zoom used for recording and transcription purposes. Jamal's parent, Ms. Jane, participated in a single 60-minute interview (See Appendix E for questions) conducted entirely via Zoom.

Data Analysis

After collecting all my interview data, I began the analysis by downloading and printing the interview transcripts. I carefully listened to the recordings while reading along to clarify any unclear words or data. Once the transcripts were cleaned, I re-read the data for a deeper understanding (Tracy, 2019) and assigned pseudonyms to the participants (Kuckartz, 2014).

I then uploaded the cleaned transcripts into NVivo 14, a widely used software for qualitative data analysis (QDA). As I re-read the transcripts, I kept my research questions (previously stated under 'Purpose') nearby for reference, ensuring that the data aligned with the questions I sought to answer. I carefully examined each section line by line, highlighting key aspects of participants' responses. Through this process, I systematically coded the data.

Based on my research, I had already identified a few initial codes, such as Pedagogical Techniques, Curriculum and Rigor, and Access to Resources. I used these codes to categorize the data while also remaining open to emerging codes that surfaced during analysis. Throughout this process, I was also guided by my theoretical frameworks, DisCrit and Elite Capture, which helped me interpret the data through a critical lens. This detailed analysis allowed me to organize different parts of the data into relevant themes and categories.

I emailed a summary of my initial findings to all participants to ensure I was not misinterpreting their interview responses. I also invited them to join me on a Zoom call if they felt anything was inaccurately represented or required clarification. Once everyone approved, I continued my analysis by re-reading the themes and the data, omitting any outliers before completing my narratives.

5.6 Rigor and Reliability/Validity

The rigor and reliability of this study were established through various methods. The first was triangulation: having multiple participants and sources of data aided data triangulation (Brantlinger et al., 2005; Eisner, 2017; Hansen et al., 2024; Tracy, 2010). I interviewed eight participants in this study: five students, two teachers, and one parent. Including multiple perspectives strengthened the study's credibility by providing rich, detailed descriptions through direct quotes, supporting my interpretations and conclusions. By integrating data from diverse sources, I was able to cross-verify information, identifying both consistencies and discrepancies in the findings. This process of triangulation enhanced the reliability of the data and offered a comprehensive understanding of the factors shaping the boys' science education, from individual experiences to broader systemic inequities.

I also conducted member checks, a common qualitative research strategy used to ensure validity. According to Merriam and Grenier (2019), member checks involve:

> Here you ask the participants to comment on your interpretation of the data. That is, you take the tentative findings back to some of the participants (from whom you derived the raw data through interviews or observations) and ask whether your interpretation "rings true." While you may have used different words, participants should be able to recognize their experience in your interpretation or suggest some fine-tuning to better capture their perspectives. (p.26)

This process ensured that the findings accurately reflected the participants' viewpoints and added credibility to the data interpretation.

My study maintained external validity by incorporating diversity in participant selection. The study included five students, two teachers, and one parent, representing different perspectives on science education. Additionally, the participants came from various educational backgrounds, including general and special education, which allowed for a broader examination of systemic barriers and supports. By capturing these diverse experiences, the findings can be applied to a broader range of educational settings, enabling readers to connect the insights to their contexts and better understand the factors influencing Black boys' engagement in science. Merriam and Grenier (2019) shared:

> providing diversity in the nature of the sites selected (an urban and a rural school, for example), or in participants interviewed, or in times and places of field visits), findings can be applied to a greater range of situations by readers or consumers of the research. (p.29)

Role of Researcher

In this study, my role as the researcher is grounded in my professional experiences as a high school teacher and my commitment to advocating for underserved students. As an educator in a neighborhood where access to STEM courses is severely limited, I have witnessed firsthand the absence of such opportunities in my school and neighboring schools despite my building housing three high schools, none offering STEM courses. Additionally, I have observed the inequitable distribution of opportunities, particularly in the case of AP Physics at the school where I currently teach, where only students with high averages (90 and above) in other science courses are selected to enroll, leaving special education students excluded from advanced academic opportunities. This systemic injustice has driven my dedication to this research, as it is essential to highlight and address the experiences of special education students in science education. Through this study, I aim to provide a platform for their voices, offering insights into how educational practices and policies continue to marginalize these students, particularly within the context of STEM fields.

5.7 Findings

The findings of this study explored the science and school experiences of African American male students in special education, alongside the perspectives of special education teachers and a parent. The study focused on Rashad, aged 15 and entering the 10th grade, and Jamal, aged 17 and entering the 11th grade, who attended different high schools in an urban Brooklyn neighborhood. Despite meeting for the first time during a summer basketball program, the boys shared commonalities as students in special education while also navigating distinct challenges. Rashad's Individualized Education Plan (IEP) was classified under emotional disturbance, whereas Jamal's IEP identified a learning disability. They provided detailed accounts of their educational journeys, offering valuable insights into their science experiences and broader school life.

In addition to the students, this study included two special education teachers who worked together at a high school in an underserved urban community. They were not teachers of Rashad or Jamal, nor did they work at the high school either boy attends. These teachers co-taught with general education teachers, wrote Individualized Education Programs (IEPs), and served as critical links in communicating special education information to parents and colleagues. They shared their perceptions of the systemic injustices faced by students in their school and provided professional insights into the barriers impacting equitable education. Lastly, Jamal's mom (Ms. Jane) contributed her perspective on her son's special education placement. She reflected on what she believed was working well in his educational experience and identified areas where changes could better support his academic and social development. This findings chapter amplified these voices, highlighting successes, challenges, and areas for improvement in special education, particularly for African American male students in urban schools. The following themes were highlighted from my discussion with the boys: pedagogy and pedagogical practices, the relevance of the curriculum, and the accessibility of resources. The themes emerging from their narratives underscored the need for systemic change to ensure more significant equity and access in science education and beyond.

Pedagogy and Pedagogical Practices

Rashad

Rashad is a 10th-grade student interested in track, basketball, reading, and video games. His favorite subject is science, and he attends a science-focused school. Rashad's interest in science was sparked by engaging teachers, particularly Ms. Rover, who provided extra support and made lessons enjoyable through projects and experiments. Rashad shared, "Honestly, I wasn't really interested in science at first but seeing how like the teachers would present it and really teach you was a strong influence." He spoke highly of Ms. Rover and shared how supportive she was in his 9th-grade high school science class. The impact of personalized support and dedication from teachers on student learning was highlighted in Rashad's experience with Ms. Rover. Here is what he said:

> Me: Have you ever had a science teacher who significantly impacted your learning? What did they do that was so effective?
>
> Rashad: Ms. Rover because she made me stay after school for tutoring and she would give me any work I'm missing during after school. And she would reteach me during after school if there was something I didn't understand.

This exchange highlighted the critical role of individualized attention and consistent support in student learning. Rashad's experience with Ms. Rover underscored how after-school tutoring, tailored reteaching, and opportunities to catch up on missed work can significantly enhance a student's understanding and engagement with science. By dedicating extra time and effort, teachers like Ms. Rover create an environment where students feel supported and empowered to succeed.

Rashad and I also talked about how he perceives his treatment in school by his teachers because of his IEP. The following is a piece of that conversation:

Me:	Can you describe a time you felt mistreated at school because of your special education status?
Rashad:	Yes in middle school. I feel like the teachers would look at my behavior more than the other kids.
Me:	How do your teachers and classmates treat you now? Is it the same or different compared to students in general education?
Rashad:	Now that I'm in high school no difference.

I also asked Rashad about the predominant race of his elementary and middle school teachers, and he said: "Most of my teachers were White. But now, in high school, my principal and many teachers are Black."

I sensed that having a teacher that looked like him was important. The conversation went like this:

Me:	How important is it for you to have a teacher or role model who shares your racial or cultural background in science?
Rashad:	I'll definitely feel more comfortable.

Me: Why do you say that?

Rashad: I'll be able to relate to them more from the jump. Like if you're coming in like, say, you're a new freshman and you're coming in and your first teacher that you have is like white. That's already someone you would feel you can't relate to.

Rashad's perspective highlights how having a teacher who shares his racial or cultural background can create an immediate connection and ease in the learning environment, ultimately supporting his engagement and sense of belonging in science.

Relevance of the Curriculum

Jamal

Jamal, a 17-year-old 11th-grade student from Brooklyn, shared insights about his experiences in science education. As a basketball player and aspiring streamer (broadcasts live videos online), Jamal found science and mathematics his least favorite subjects due to the overwhelming amount of information and complex terminology. He shared with me the following about his science classes: "There's a lot of information being thrown at you and it's hard to process it. This is sometimes because the words are kind of big and confusing." Jamal did have some positive experiences in science which connected with times when the content allowed for hands-on activities. He recalled a time in middle school when he found science, it was called Living Environment, particularly interesting: "Back in middle school, we used to play with the frogs. Cut them open and do experiments. Science was a little bit interesting then."

Jamal also found science to be interesting and enjoyable when it connected with his home life or experiences. He enjoyed learning about cells in the Living Environment and weather patterns in Earth Science as these topics resonated with him. During the weather lesson in Earth

Science class, he remembered hearing that information while at home listening to the weather news with his mom. That connecting moment sparked his interest in learning about the weather. When I asked Jamal if he found any aspects of his science classes to be particularly engaging or challenging, his response was:

> I was engaged in Earth Science when we learned about the weather. That topic was interesting, so I liked it. The information was not too much, and I already knew things about the weather. When my mom was sitting down watching the news, sometimes I would sit and watch the news with her. So that made the topic more interesting, and when I see something that's interesting, I kind of want to approach it.

Jamal was also very excited to learn about cells in his Living Environment science class because it reminded him of the show "Lab Rats" he used to watch. He exclaimed: "Because I used to always watch this show, I didn't realize they were talking about science and stuff. But when we did cells, I realized the show I used to watch had the same things." Some studies (Almarode et al., 2012 & Chen et al., 2023) suggest a connection between science media engagement and science interest. However, simply watching science-related content on television at home without opportunities for hands-on engagement may limit the development of genuine interest.

Jamal expressed that he would find science learning more effective if it were more hands-on and personally relatable. At his school, hands-on meant labs, but they only happened once a week, which left the other days boring. He would be more interested in learning if there were more lab activities. Furthermore, since he is a visual learner, hands-on would be more conducive to his success in science. Jamal shared: "Like labs are cool; we have them every week. But I'm more of a visual learner, and I prefer activities like that in class every day and not just Friday during labs." However, being removed from class for extra support further limited his access to the hands-on learning he found most effective.

Rashad shared his appreciation for hands-on activities in science, crediting them with fostering his interest in the subject. He mentioned experiments, such as the diffusion experiment, as a fascinating and memorable experience. Although Rashad had so many positive experiences in science, he was not enrolled in any AP courses, and his school did not have any STEM courses for freshmen or sophomores. Rashad expressed interest in Robotics. When I asked how being enrolled in a Robotics class would enhance his interest in science, he responded: "....that would help me with engineering." Rashad's exclusion from advanced opportunities, despite his evident enthusiasm and potential, illustrates how systemic barriers disproportionately limit access for marginalized students. Furthermore, Elite Capture theory provides insight into how resources and opportunities, such as AP and STEM courses, are often reserved for a select group of students, perpetuating a cycle of privilege that excludes those like Rashad who could greatly benefit from them.

The Accessibility of Resources

If students with IEPs are being removed from their regular classes for extra support, that support should be tailored to address their specific academic challenges. For Jamal, this meant providing strategies to help him manage complex vocabulary and break down the overwhelming workload in his science class. For clarity, according to Jamal, when he was removed from his regular classes for extra support, there was no fixed schedule for these removals. As a result, he could be pulled out at any time of the day from any class. At the school where I currently teach, students with IEPs are not supposed to be removed from their core classes (science, mathematics, and English). However, I have witnessed this happen multiple times during science classes while

I was teaching. In my opinion, students, especially those with IEPs who may struggle to catch up on missed work, should not be removed from core classes. If they are, the support provided in pull-out rooms should be content-based and directly aligned with the material they are missing. Despite these pull-out sessions, Jamal did not receive strategies that truly helped him when he was in these support rooms.

When I asked Jamal: "Do you know of any strategies you could use to help process those words and all the information given to you?" he simply responded, "No." Here is an excerpt from that portion of our conversation:

> Me: Since you have an IEP, you get pulled out of the classroom and into a separate room. Who do you work with in that room? What do you do there?
>
> Jamal: I work with Ms. Sutner, she's a social worker. And she just gives me or the others time to work on homework or other assignments. Sometimes she helps us and sometimes we do group sessions and talk about how school and stuff is going.
>
> Me: Does she give you any strategies to help study or process those big words in science?
>
> Jamal: No

This highlighted a critical gap in delivering additional support and aligning with the student's needs.

Additional support/resources in the form of field trips and individual attention were expressed by Jamal as different ways in which science can be made more accessible to him at his school. When asked about resources in the classroom that he believes, if present, would better help him learn/access science, Jamal's response was, "Maybe field trips." He has never been on a field trip for science. He also expressed the point of individual support. Providing some clarifying information about special education and students with IEPs is important for context. Some students with an IEP are assigned a paraprofessional, a staff member who assists them with academic tasks or helps manage challenging behaviors. The assignment of a paraprofessional is often requested by the parent as part of the IEP process or recommended by the school. However, the availability of paraprofessionals is closely tied to school funding, as the number of paraprofessionals a school can employ depends on its budget and resources. Jamal did not have a paraprofessional assigned to him; however, his classes were co-taught, meaning both a general education teacher and a special education teacher were present. The role of the special education teacher in this setting is to provide targeted support to students with IEPs within the classroom. However, Jamal believes that the support was not enough. Here is how that conversation went:

> Me: How do you think science education could be improved to better meet the needs of students like yourself?
>
> Jamal: Like working with students individually. Like the other teacher in the classroom should work with only the IEP students and give us help. Like if we're not doing well on quizzes or exams or not paying attention, I feel like the teacher should work with us.

While having a co-teacher in the classroom is intended to support students with IEPs, these resources are often stretched too thin. With large class sizes and multiple students requiring assistance, the special education teacher may not always be able to reach every student with an

IEP. Additionally, they may sometimes need to assist general education students, limiting the individualized attention students with IEPs require.

Overall, Jamal desired a more supportive and inclusive environment that acknowledged special education students' unique needs, particularly in developing academic skills. Increased career guidance and exposure to STEM opportunities could also help Jamal and others pursue future aspirations. It is important to note that Jamal has never been enrolled in an AP course, and his school does not offer STEM courses.

The resources available to the students at Rashad's school were also limited, even though it was a science-based school. Rashad seemed to realize that the resources that were not available could be linked to racial inequality. Our discussion went like this:

> Me: How do societal issues, such as racial inequality, impact your interest or involvement in science?
>
> Rashad: I do realize because of where we're at, it's not a highly funded school that we have. So like our resources, it's very limited. Sometimes we have to share the microscopes and the textbooks. We pass them around because we don't have enough for everybody

However, he did express that his teacher found ways to make it work. Limited resources can be a challenge for all students, especially those in special education who may need extra support, like the previous participant, Jamal. On the other hand, not all IEP classifications indicate intellectual challenges.

Rashad's IEP classification was emotional disturbance, which originated from behavioral challenges he experienced in elementary school and necessitated the support of a paraprofessional. It is important to note that this classification was unrelated to his intellectual abilities. Unlike Jamal, Rashad was never pulled out from his general classes; he had a paraprofessional with him all day. This made him feel very uncomfortable. Rashad shared: “I’m embarrassed to have a para. Not many students have one.” He expressed that he did not believe he needed to have a paraprofessional or even an IEP anymore because he did not have any behavioral problems as he did back in elementary school. Rashad’s words were: “I don’t want to have a para all the way to college. And I’ve seen a change in my behavior going up because I’ve had an IEP since like elementary school.” I then asked if his mom knew he could get tested out of his IEP/ special education status, and his response was: “I don’t know. I didn’t even know that was a thing.” Many students feel embarrassed about having a paraprofessional accompany them, particularly in high school, as it can draw unwanted attention and make them feel singled out. In Rashad’s case, neither he nor his mother was aware that he could potentially be re-evaluated to exit his IEP classification. This lack of knowledge highlights how critical information is often withheld or inaccessible to minoritized groups, a clear example of elite capture. Limiting access to such essential resources and opportunities perpetuates inequities and reinforces existing power dynamics.

Special Education Teachers

In this section, I summarized the main themes discussed during the conversations with the two special education teachers. I focused on their perception of the students they see being recommended for an IEP. Then, I looked at their experiences with Black boys in special education, resources, inclusion, and challenges for Black boys in STEM.

Special Education Placement

Mr. Dior shared that, in his six years of teaching, the recommendation for a student to be placed in special education typically came from a teacher, not a parent. The teacher would suggest that the student be evaluated, and the process would begin from there. This placement aims to provide students with the additional services they need to succeed academically. As Mr. Dior explained:

> OK, so an IEP is an individualized education program tailored to students with specific disabilities. It helps the student adhere to the curriculum and learn at the pace that they need versus at the pace that is provided by the teacher in order for a student to qualify for an IEP, they must be evaluated first and if they are evaluated and they have a disability, they are then provided a program that can help.

Once a student receives an IEP, the main goal is for them to receive the necessary support, not to be stigmatized or given fewer opportunities than their general education peers. The question then arose about whether he believed every student who was recommended for special education required the services. Mr. Dior disagreed that all recommendations were necessary. He believed that sometimes the recommendation came from a place of misunderstanding. He shared:

> So, in certain instances, it is not always agreeable because If we look at students from different cultures that come into the education system here, their way of learning may be a lot different than the standard. Learning of the American student, you know, their pace may be different. Um, some of the times it could just be a language barrier, causing the student not to learn. In a way that other general educated students could learn, so not every situation. Should be addressed with an IEP. Um, You know, I'm a firm believer that before we even request an IEP we see what's going on within the student's life, and I feel like certain backgrounds, ethnic backgrounds don't tend to understand the African American background, so they tend to rely on just the IEP as a way to solve the students'

> problem when most of the time it's not even high but they tend to just rely on that because it's an easier way for them to you know, pass the student along with the system.

Mr. Falium, the second special education teacher, also shared similar sentiments. He talked about lack of prior knowledge and reading skills as being the reasons why some students at a high school may be struggling in science classes. He expressed:

> And to me, I've seen kids who they, they have no visible learning disability. What they really lack is an adequate fund of prior knowledge to help them access the high school curriculum, and a lot of that lack, a lot of that deficit, and I, I know we're not supposed to use that model, but if you don't have the vocabulary that you need to understand what's going on in the lesson, you're gonna just be lost. And a lot of that work involves just building the vocabulary so that these kids, when they hear a word in class, they know what it represents and can use it as a tool to understand what you'll be teaching. And a lot of them lack reading and comprehension. When I was a kid growing up, you had 4 television channels, and if there wasn't anything on, the book was your next thing, next go to.

Mr. Falium highlighted that many students he worked with at the high schools he taught struggled with basic reading skills. Some had never been exposed to science before high school, so they entered high school science with significant gaps in their knowledge. The unfamiliar language and concepts overwhelmed them, causing them to disengage and eventually be recommended for special education because they are now seen as having a learning disability.

Challenges in Special Education and Science Teaching

Students not having prior knowledge or reading difficulties posed significant challenges in the classroom. However, one of the main challenges expressed by Mr. Falium was the school’s focus on teaching for standardized tests instead of identifying the students’ strengths and building on that. He shared his disappointment:

> And um again, all of them have had some sort of talent or gift or interest or passion that if a teacher knew how to capitalize this could turn this kid into just a big eager student, but we don’t do that. We’re yoked to regents tests. We have to teach them what’s gonna be on that test. We can’t test for talent, passion, many of the other things that we learning. None of that is of any relevance here. I interviewed for several jobs last summer, and every time, I got asked, what are you gonna do to help this student pass Regents? Not, what are you gonna do to help this kid feel more confident in school? What are you gonna do to help this kid learn to work power levers of power in a democracy? What are you gonna do when this kid is confronted with, let’s just say some racist garbage. How are you going to teach that kid to use rhetoric to combat that? None of this. How are you gonna pass the test? I admit that that is a very narrow, incredibly narrow measure.

Just for context, Mr. Falium is a White teacher who felt very strongly about the racism that exists in schools that are predominantly attended by Black and Brown students. His administration often reprimands him for how he teaches and his attempts at teaching racial literacy skills to the students under his care.

Resources, Inclusion, and Improving the Science Curriculum

Mr. Dior believed African American male students in special education do not have access to the same resources and opportunities in science education as their peers, with schools in wealthier neighborhoods having more advanced technology and budgets compared to schools in urban areas like East Brooklyn. He shared;

> So let's compare some of the standardized high school versus a regular school, right? It's a lot different. It's a lot different in terms of the materials they have, it's a lot different in terms of budget they have. It's a lot different in terms of everything that they have, you know, I say Brooklyn schools get treated worse because they don't tend to get the budget that they deserve as opposed to the standardized high schools, city or within, let's be real, you know, the rich neighborhoods around there like schools in Park Slope, right? They have at least a lot more advanced technology or at that at least a lot more budget in certain schools in Brooklyn. And they're both in the same borough, which tells a lot about certain situations.

Mr. Dior also expressed that he has not had any male special education students in AP science classes at his school, and this is an issue rarely addressed by the administration. Mr. Falium also shared similar sentiments about the resources available to special education students and teachers. He discussed the lack of support from school administration and the gap between expectations and resources provided for special education teachers. The resources are inappropriate or insufficient to support the students in science content classes.

Mr. Falium explained that some students in special education are placed in subject areas, like science, where they struggle. He suggested that offering a foundational class in science skills during their freshman year, before placing them in content-specific science classes. Mr. Falium said:

> I would also start teaching them that kind of stuff (he was referring to lab skills) that you guys have to teach at the beginning of the year, lab lessons so that when they get there they have that prior knowledge and they're ready to go on and advance in the class. This could help build their confidence and competence.

Mr. Falium also discussed strategies for creating inclusive learning environments, stressing the need for a thoughtful approach to avoid stigmatizing students with IEPs because he noticed that the students with IEPs would feel embarrassed when he came around to help them. He emphasized the importance of understanding each student's unique needs and providing support in an empowering way without making them feel uncomfortable or singled out.

Impact of Special Education Label and Racial Identity on Students

Mr. Falium discussed how the special education label and racial identity can negatively impact students' self-esteem and confidence. He emphasized the need to address unconscious biases and racism in education and suggested changes in special education and science education to support African American male students better. Some suggestions included an early introduction to scientific concepts, providing more information about STEM careers, and even having STEM classes.

Mr. Dior emphasized the importance of increasing the representation of African American professionals in schools and providing equitable, hands-on learning opportunities to engage better and support students in science education. He also expressed concern about how school policies affect student learning. According to Mr. Dior, these policies may not align with students' backgrounds and lived experiences, and practices such as separating them for testing can harm their confidence and self-perception.

Parent Views

I interviewed Ms. Jane, Jamal's mother, and I extracted her views about special education and accessibility to learning for her students. Her views were very similar to those of the students and teachers. Much of what she said reflected her son's time in special education. Ms. Jane mentioned that she had recommended he be tested when he was in second grade because she believed he needed the extra support. Here are some of the major themes I extracted from the conversation.

Making Learning Accessible

Ms. Jane suggested incorporating more hands-on, visual activities, such as dissecting frogs, science projects, and science fairs, to make learning fun and engaging for students like her son with a learning disability. She emphasized the importance of making learning interactive and relatable to Jamal's interests, such as incorporating examples related to cars or basketball. These examples were based on her son's interests. Jamal also expressed most of what she said.

Ms. Jane did not believe that the science curriculum was inclusive, and Jamal's interests or potential in science were not strongly encouraged in his current educational setting. For clarity, the educational setting in this context referred to the structure of the science classes offered at Jamal's school, including the way science lessons are taught and the resources available or not available to ensure his academic success in science. This suggests that Ms. Jane felt the science curriculum was not designed to reflect or embrace the diversity of Jamal's' background, experiences, or interests. Ms. Jane believed her child's science potential was not fully supported or nurtured in the current educational setting. The curriculum and teaching methods may not have been responsive to Jamal's individual needs or passions, resulting in a lack of encouragement or motivation to excel in science.

Ms. Jane also did not blame the teachers for the curriculum. She expressed that she knew the pressures of teaching for standardized tests such as the regents. This is what she said:

> Well, I have different thoughts because then it's not, it's also not fair to the teachers because you guys get pressured as well. But if your class don't do good with testing, you guys get the end of the stick that we as parents don't see and the students don't see. The

students won't understand that the teachers get in trouble because that teacher didn't do well for his or her class to pass. Because it looks bad when we Google that school and be like, OK, your testing is really, you know, not at a certain level. So it's also not fair for the teachers that need to rush to teach these kids and you guys have other lessons that you guys gotta do on a daily basis to meet that standard. Yeah. So I feel like it's a lot of pressure to the teachers and there's a lot also pressure for the students to grasp all those information because like I said, some students, um, you can teach them something today and by the end of the day they they forgot what they learned today.

It was reassuring to hear that Ms. Jane understood the pressures on the teachers while sharing her concerns for her son.

5.8 Discussion

This study focused on the experiences of African American male students with special education needs in science education, particularly within the context of urban schools that lack adequate resources and opportunities. The discussion below explores the key themes emerging from the experiences of these students, particularly within under-resourced urban schools. Through the narratives of Rashad and Jamal, the study highlighted how systemic barriers, such as limited access to advanced science courses, restrictive special education placements, and the broader inequities embedded in the education system, shape their academic journeys. Rashad's story further reveals the emotional and social challenges tied to his IEP classification and the presence of a paraprofessional, adding another layer of complexity to his educational experience. Their frustrations reflect the larger structural inequities outlined in Dis/ability Critical Race Theory (DisCrit), which emphasizes the intersection of race and disability in shaping educational access and opportunity. By examining their experiences through this lens, we can better understand how institutionalized practices continue to marginalize students at the intersection of race and ability, limiting their full participation in science education.

Inclusive Pedagogy and DisCrit

Jamal’s preference for hands-on and personally relatable learning highlights the importance of inclusive pedagogy, aligning closely with the principles of Dis/ability Critical Race Theory (DisCrit). DisCrit challenges traditional educational practices that often fail to meet the needs of marginalized students by addressing the intersection of race and dis/ability (Annamma, Connor, & Ferri, 2013). In Jamal’s case, the lack of engaging and accessible science instruction highlights systemic barriers that perpetuate educational inequities, particularly for Black students with IEPs. Implementing culturally relevant and accessible teaching strategies can help disrupt these exclusionary practices and foster a more equitable learning environment (Ladson-Billings, 1995).

Elite Capture and Resource Allocation

The absence of engaging, hands-on science instruction for students like Jamal reflects how systemic inequities limit access to high-quality educational experiences. This dynamic ties into the concept of elite capture, where resources intended for marginalized groups are appropriated or redirected, leaving these students without essential support (Dutta, 2009). For example, students with IEPs are often removed from regular classrooms under the pretense of receiving additional assistance, but they frequently do not receive the meaningful support they need. Jamal expressed frustration with science being especially challenging because, “a lot of work gets thrown at him at once,” and the complex terminology made it difficult for him to keep up. These barriers reflect how systemic inequities restrict students’ ability to succeed academically.

Standardized Testing and Limited Educational Opportunities

Science teachers, particularly Mr. Dior and Mr. Falium, highlighted concerns regarding special education placements, which are often based on behavioral issues rather than genuine learning disabilities. They also noted how the overemphasis on standardized testing limits opportunities for individualized instruction and creative teaching strategies, further disadvantaging students with IEPs (Au, 2008). This test-driven system exacerbates inequities by restricting educators' ability to explore student interests and implement differentiated learning approaches.

Underfunding of Special Education Resources

The lack of funding for special education resources, particularly paraprofessionals, further exacerbates educational disparities. In many schools, especially those in underserved areas, special education teachers are overburdened in co-taught classrooms, and the absence of paraprofessionals leaves students without the additional support they need (Harry & Klingner, 2006). Paraprofessionals play a crucial role in bridging learning gaps by providing one-on-one assistance, helping students navigate challenging material, and ensuring their individual learning needs are met. However, systemic underfunding reflects a broader issue of elite capture, where resources are disproportionately allocated, benefiting certain groups while leaving marginalized students, such as those with IEPs, without adequate support. This inequitable distribution of resources further limits educational opportunities, perpetuating cycles of exclusion and academic disadvantage.

Parental Advocacy for Inclusive Curriculum

Jamal's mother, Ms. Jane, echoed these concerns, calling for a more engaging and inclusive science curriculum that aligns with students' interests and strengths. She also pointed to the systemic issues surrounding standardized testing and the lack of long-term support for students' growth and aspirations. Her perspective reinforces the need for systemic changes that prioritize equity in education, ensuring that all students, especially those in special education, have access to meaningful and enriching learning experiences (Yosso, 2005).

Limitations and Implications

Several limitations exist within this study. First, the sample size is relatively small, consisting only of a few special education students, teachers, and one parent. While the data gathered provides valuable insights, it may not fully represent the broader experiences of African American male students in special education across more urban schools. The focus on a single school setting restricts the generalizability of the findings to other districts with different resources, student populations, and institutional policies Additionally, the study is limited by its reliance on interviews and personal narratives, which, while rich in detail, may be subject to individual biases or selective memories. The emphasis on interviews may not fully capture the nuanced dynamics of classroom interactions, school policies, and the broader educational environment shaping students' experiences in special education.

5.9 Conclusion

The findings from this study illustrate how DisCrit and Elite Capture intersect to shape the educational experiences of Black male students with disabilities. DisCrit provides a framework for understanding the racialized nature of disability in education, emphasizing how the intersection of race and disability leads to compounded forms of marginalization and inequity. Elite capture, on the other hand, highlights how systems of power control resources, information, and policies and perpetuate inequalities that disproportionately affect minoritized groups, such as Black students in special education.

Together, DisCrit and Elite Capture reveal the systemic nature of the barriers these students face in accessing quality education, highlighting the need for structural changes that prioritize equity, inclusivity, and the acknowledgment of students' diverse needs and backgrounds (Mensah & Pierre, 2025). These findings underscore the necessity of shifting educational practices away from standardized test-driven models toward a more inclusive, culturally responsive, and individualized approach that centers on the experiences and potential of all students, particularly those from marginalized racial and disability backgrounds.

Chapter 6: Discussion, Implications, and Conclusion

This chapter presents and summarizes the major findings of this study, which explored the science education experiences of African American male high school students, including those in general and special education. The participants included three general education high school boys, two special education high school boys, two special education high school teachers, and the mother of one special education boy. As outlined in Chapter 1, the definitions of general education and special education differ within the U.S. public education system. General education students typically do not have physical or learning disabilities that could hinder their academic progress, allowing them to engage with educational material without extra support. In contrast, students with special education needs may have physical or cognitive disabilities that require accommodations or additional resources to support their learning and academic achievement.

This study sought to answer the following research questions:

1. How do African American male high school students, both in general and special education, perceive their science education?
2. What factors shape their engagement and success in science?
3. How do their experiences influence their decisions to pursue science-related fields after high school?

By addressing these questions, this study aimed to explore students' perceptions, levels of engagement, and the factors that contribute to their success in science education. Framed through Dis/ability Critical Race Theory (DisCrit) (Annamma et al., 2012) and Elite Capture (Dutta, 2009), the findings reveal the intricate intersections of race, disability status, and systemic inequities that shape these students' educational experiences and influence their perceptions of science education. The following is a summary of my findings, emphasizing their alignment with existing literature.

6.1 Major Findings of the Study

Perceptions of Science Education

The five students in this study expressed both positive and negative perceptions of their science education, shaped by three key factors: teacher-student interactions, the relevance of the curriculum, and access to resources. These findings align with the existing literature on science education disparities in urban schools, the impact of standardized testing, and the challenges faced by Black boys and students with special education needs (Ladson-Billings, 2006; Warren & Rosebery, 2011).

Teacher-Student Interactions

Positive Perceptions

The findings indicate that positive teacher-student interactions, including personalized attention and flexible deadlines, had a significant impact on students, particularly those in special education. The boys expressed gratitude for teachers prioritizing content understanding over grades, reducing the pressure to perform for test scores alone. Also, teachers who provided extra tutoring, flexible deadlines, and opportunities to catch up on missed work were incredibly impactful for special education students, helping them succeed. These findings align with existing literature on the importance of caring, supportive teacher-student relationships in fostering academic success (Ladson-Billings, 2006). These interactions, particularly in the context of special education, resonate with DisCrit, which emphasizes how individualized attention can disrupt systemic educational barriers. Teachers' empathy and attention to individual student needs provide an antidote to rigid educational systems that often overlook the needs of marginalized students, such as black boys and those in special education.

However, while the positive perceptions align with the literature on the power of teacher support, they also highlight a limitation in the existing research. Much of the literature tends to focus on generalized, culturally responsive practices for teaching and learning. My findings, in contrast, illustrate the importance of personalized approaches tailored to meet individual students' needs, which should be further integrated into teacher-student interactions.

Relevance of the Curriculum

Negative Perceptions

Despite these positive experiences, the negative perceptions reported by students, particularly their dissatisfaction with the lack of connection between science content and their cultural backgrounds, resonate with DisCrit's critique of culturally exclusionary curricula. The students noted that their science classes failed to reflect their cultural backgrounds or interests. For instance, Caleb's frustration with the curriculum's disconnect from his Caribbean heritage and basketball interests reflects how dominant educational systems, which prioritize standardized content, fail to engage students from marginalized cultural backgrounds. This study expands the literature by demonstrating how this exclusion is not only an issue of cultural representation but also of engagement and relevance. Students are less likely to connect with and excel in science if it does not reflect their lived experiences or interests.

Another student, Jamal, found science more engaging when it connected to topics he had encountered through TV shows (Lab Rats) or the news. These findings align with DisCrit's emphasis on addressing cultural exclusion in curriculum design and underscore how elite systems, like standardized science curricula, capture educational priorities, sidelining diverse cultural perspectives. While the literature has discussed the importance of cultural relevance (Gay, 2010; Ladson-Billings, 2006; Warren & Rosebery, 2011), my study emphasizes how deeply this lack of relevance impacts engagement and success, particularly among students in underserved urban schools.

The lack of hands-on, engaging science is a significant barrier, particularly for students with special education needs. Limited resources in urban schools, attended predominantly by Black and Brown students, resulted in minimal access to laboratory experiences or innovative curricula. Students reported visiting the lab only once weekly and described the activities as uninspiring “cookbook” experiments. This lack of meaningful engagement reflects how elite systems hoard resources, leaving underserved schools with inadequate support for experiential learning —a problem directly tied to Elite Capture.

The lack of access to innovative curricula and the minimal exposure to lab-based science align with the broader literature on resource disparities in urban schools (Ladson-Billings, 2006). These findings extend this conversation by emphasizing the specific impact of these inequities on special education students, who are often further isolated from meaningful science engagement due to systemic barriers in access to resources.

Special Education Perspectives

Teachers and parents of special education students shared similar concerns about cultural exclusion and systemic inequities. Mr. Dior and Mr. Falium noted that students’ cultural backgrounds were often overlooked when placing them in special education and designing their science curriculum. Students entered high school with significant gaps in reading comprehension and basic science knowledge, deficits compounded by the lack of introductory science skills courses, science clubs, and extracurricular activities. The students’ lack of foundational science knowledge and the absence of introductory courses or science clubs mirrors the findings of other studies on the marginalization of special education students (Warren & Rosebery, 2011). However, my study emphasized the critical role of introductory science skills in determining whether or not a student is placed in special education. Access to these resources can equip students with the foundational knowledge and confidence necessary for success in core science classes and not seen as having a learning disability.

Further research is needed to examine how possessing introductory science skills upon entering high school influences students' success and interest in science. These foundational skills may better prepare students for the Regents exam and other standardized tests, reducing the need for remediation while keeping pace with the established curriculum. Ms. Jane and her son Jamal highlighted the detrimental focus on teaching towards standardized tests. This emphasis, driven by systemic priorities, detracts from fostering genuine understanding and enjoyment of science. DisCrit frames this as a form of structural ableism and racism, where standardized metrics of achievement fail to accommodate diverse learning needs, perpetuating inequities.

Accessibility of Resources

Systemic Barriers

The findings reveal numerous systemic barriers that undermine students' science education experiences. Underserved schools offer limited science courses and lack advanced opportunities like AP science classes. For special education students, additional obstacles, including the stigma associated with IEPs and insufficient support systems, exacerbate these inequities. This reflects the wider literature on educational inequities (Ladson-Billings, 2006; Warren & Rosebery, 2011). Using Elite Capture, these systemic barriers can be seen as a form of educational hoarding; privileged schools receive resources and advanced opportunities, while students in underserved communities are left behind. This dynamic is particularly harmful for special education students, who face both academic and social stigma due to their IEPs.

DisCrit highlights how these barriers perpetuate ableist and racist practices, marginalizing students who do not fit the dominant norm. Meanwhile, Elite Capture provides a lens to examine how policies, such as those prioritizing standardized testing and elite course offerings, disproportionately benefit privileged groups, leaving underserved populations with fewer opportunities to excel. These systemic inequities are reinforced by the misallocation of resources, which disproportionately affect marginalized groups, including students with IEPs.

Dis/ability Does Not Mean Inability

Caleb did not like school, but that dislike does not reflect his ability to excel academically. A lack of interest is not synonymous with a lack of ability. Like many students, Caleb was searching for relevance. He wanted to understand the purpose behind what he was learning and how it applied to his life. Wanting to understand is a common desire among students who often ask, "Why do we need to learn this?" or "How is this going to help me in life?" When students, especially Black boys like Caleb, cannot see the connection between science and their lived experiences, they begin to disengage. However, this disengagement should not be mistaken for dis/ability or an inability to learn. Instead, it highlights the absence of cultural and personal connectedness in the science curriculum.

This theme of disconnection was echoed by another participant, Jamal, a student with an Individualized Education Program (IEP) under the category of learning disability. Jamal expressed that science became more interesting and accessible when it related to topics he already knew or found familiar. His enthusiasm grew when lessons were grounded in familiar issues, such as the unit on Weather in Earth Science, which he connected to real-life experiences like watching the news with his mother. This raises an important question: is it truly a learning disability, or is it a failure of the curriculum and pedagogy to connect with the learner? When science is taught without regard for students' backgrounds, interests, and ways of knowing, it alienates those who do not see themselves reflected in the content. My study aims to explore the role of relevance, connectedness, and culturally responsive pedagogy in shaping the science experiences of Black boys, both in general and special education.

Elite Capture

What have the elites (government, White folks in power) done in education to prevent Blacks from reaching the level of attainment that would allow Elite Capture not to work, to be null and void? The elites, specifically government structures and predominantly White policymakers, have historically and systemically constructed an education system that maintains inequality and hinders Black students, particularly Black boys and those in special education, from reaching levels of academic attainment that would disrupt or render elite capture ineffective.

Through policies like high-stakes testing, underfunding of schools in Black and Brown neighborhoods, limited access to rigorous STEM courses, and disproportionate placement of Black boys in special education under subjective labels like "emotionally disturbed" or "learning disabled," the system redirects Black intellectual potential away from empowerment and toward containment. In my study, I highlighted how science education, a gateway to high-paying, elite fields, is often inaccessible or irrelevant to Black boys due to cultural disconnect, curriculum design, and lack of teacher engagement with students' lived experiences. For example, students like Caleb and Jamal disengaged not because of ability but because science felt unrelated to their realities. This manufactured disconnection is a form of gatekeeping that ensures Black boys do not fully access the economic and social capital that advanced education can provide.

Furthermore, the glamorization of basketball as the primary “way out” of poverty for Black boys is no accident. Academic success, particularly in STEM, remains culturally and structurally discouraged. As Ladson-Billings (1998) noted, labeling Black boys as “just athletes” has become a normative cultural narrative, one that both reveres and diminishes them simultaneously. By reinforcing these narrow identities, the elite preserves a system where Black boys are celebrated for physical prowess but denied intellectual development and power.

In essence, the elite has constructed an educational system that undermines potential through miseducation, cultural irrelevance, and systemic barriers. Until these conditions change, elite capture will remain a successful mechanism of control, not because Black students lack ability, but because the system denies them the means to exercise it fully.

Despite the supposed progress since the era of legalized segregation, the historical marginalization of African Americans in education continues to manifest in subtle but deeply impactful ways. One glaring example is the policy shift brought on by the No Child Left Behind Act (NCLB). This policy redirected educational priorities toward reading and mathematics, often at the expense of science education (Berg & Mensah, 2014). While literacy is crucial, it is worth questioning why, after the Sputnik crisis, which initially propelled the United States to emphasize science and engineering, the federal focus later shifted away from these disciplines. Given the growing Black population in urban public schools and their increasing engagement with science, one cannot help but ask: Who benefits from this shift, and who is excluded?

The sidelining of science in schools serving predominantly Black and Brown students seems less like an oversight and more like a calculated move, one aligned with the mechanisms of elite capture. As philosopher Olúfẹ́mi Táíwò argues, elite capture occurs when powerful groups co-opt language, policies, or reforms intended to benefit the marginalized, ultimately maintaining the status quo (CITATION YEAR). In this case, the elite shifts their focus to literacy not to elevate education holistically but to distract from and deny access to STEM fields — domains of high economic mobility and intellectual power (CITE Ebony McGee's work).

In my experience as a high school science teacher in an underserved urban community, the neglect is glaring. In six years, I have never once been invited to any science-specific professional development, while the English department regularly attends such training. This minimal participation from the science department in professional development sessions is not due to our school's stellar science outcomes; on the contrary, our students' science Regents pass rates remain dismal. Yet, no institutional effort has been made to improve science test scores. More disturbingly, our shared school building, which houses three predominantly African American high schools, had our only lab technician reassigned to a school with mostly White and Asian students. This decision sends a clear message: Black students are not expected to engage meaningfully with science, nor are they expected to excel in it.

This systemic divestment from science education in Black schools is not incidental; it is strategic. It ensures that access to the cultural capital and financial benefits of STEM careers remains limited to those already within elite circles. It keeps students like mine in positions where academic disengagement is almost inevitable and reinforces the racialized belief that science is not for them. This is elite capture in practice: reallocating resources, shaping curriculum, and instituting policies that look neutral on the surface but continue to privilege certain groups while disadvantaging others.

The removal of the lab technician from our building is not just a logistical inconvenience; it has significant implications for equity, especially for special education students. Personally, having a lab technician made it easier to quickly prepare and implement hands-on science activities, even on short notice. Now, without that support, planning and executing meaningful lab experiences requires more time, materials, and sometimes unrealistic levels of multitasking for a single teacher. As a result, the frequency and quality of hands-on learning experiences have declined.

This is especially harmful to my special education students, who often rely on visual and tactile learning to engage with and retain scientific concepts. In this study, several participants echoed this need. Jamol, one of the special education students, explicitly stated that science became more interesting and understandable when he was doing something physical—building, observing or experimenting. These experiences enabled him to connect abstract scientific concepts to real-world applications. Jamal expressed, “Like labs are cool; we have them every week. But I’m more of a visual learner, and I prefer activities like that in class every day and not just Friday during labs.” And his mom, Ms. Jane, also agreed; she said:

> It can make it fun learning instead of just sitting there reading off of a book or Reading off the board; not a lot of kids can grasp the information by just writing it, but if they visualize it and it is in their face, they can learn from touching and, you know, it’s like a sensory thing for a lot of kids.

When resources like a lab technician are removed from schools that serve predominantly Black and Brown students, especially those with a high population of students with IEPs, it becomes another example of systemic neglect masquerading as a budgetary or administrative decision. It directly limits the kinds of learning opportunities students receive, which in turn affects their academic performance, engagement, and confidence. This ties back to elite capture: while reforms and policies claim to improve education equitably, they often exclude or under-resource the very students they were designed to support. In this case, denying access to hands-on, differentiated science instruction ensures that students with disabilities remain marginalized, underprepared, and disconnected from STEM pathways.

Táíwò (2022) writes, “Some students are pipelined to PhDs, while others are pipelined to prisons – and the very oppressive structures we aim to challenge largely explain who goes where” (p. 48). This powerful statement resonates with my observations, not only in my study but also through the educational experiences of my son and the students I teach at a predominantly Black high school. Black boys are disproportionately placed in special education not because of actual cognitive or learning disabilities but because they are perceived as “bad” or incapable of academic excellence. Their inability or unwillingness to conform to White, middle-class norms, such as sitting still for extended periods, speaking softly, or following authority without question, often earns them the label of “disruptive,” “emotionally disturbed,” or “unteachable.”

But what truly makes a good student? From a DisCrit perspective, a good student is not defined by passive compliance or standardized test scores. A good student is intellectually curious, critical of oppressive systems, and willing to speak up when something does not make sense, especially when curricula erase or ignore their cultural identities. A good student, particularly in science, mirrors the very essence of scientific thinking: questioning, challenging, revising, and seeking truth. Imagine if all the great scientists in history had quietly accepted failure or inaccurate conclusions; our world would not have seen the transformative breakthroughs we benefit from today. Likewise, when Black boys “talk back,” they often exhibit the same critical thinking skills that we claim to value in education. However, because of racist and ableist stereotypes, their expressions of engagement are misread as aggression or defiance.

This is where DisCrit helps us understand the intersecting forms of oppression at play. Black boys are not just penalized for being Black; those placed in special education experience a double bind, punished both for their racial identity and for being labeled with a dis/ability. A White student who challenges a teacher may be viewed as assertive or a future lawyer, but a Black student doing the same is often labeled emotionally disturbed or threatening. These biased interpretations act as filtering mechanisms, as Táíwò (2022) pointed out: "Many aspects of our social system serve as filtering mechanisms, determining which interactions happen and between whom, and thus, what social patterns people are in a position to observe" (pp. 47–48). These filters determine who is tracked for gifted programs, PhDs, and leadership roles, and who is tracked for remedial classes, suspensions, and prison.

Culturally, we must interrogate how race, ableness, and ideas of "goodness" are deeply entangled in school systems. The construct of "goodness" is not neutral; it has been shaped by White, Eurocentric cultural values that equate goodness with quietness, obedience, emotional restraint, and deference to authority. In contrast, many African diasporic cultural expressions, such as assertiveness, communal discussion, bodily movement, and spirited engagement, are misread as unruliness or defiance. Black cultural ways of knowing and being are not just ignored in school; they are criminalized.

Ableism adds another layer: students who learn differently or express themselves through movement, sound, or emotion are marked as deficient. In a classroom that defines ability and intelligence through test performance and compliance, students who don't fit the mold are not seen as good or capable; they are tracked out of opportunity. When Black students resist or diverge from these ableist and racist expectations, they are not met with understanding or culturally responsive pedagogy; they are met with exclusion.

Thus, race and ableness are culturally constructed and enforced through the school system's narrow definitions of what is "good." Goodness, in this sense, becomes a gatekeeping tool; those who embody White and ableist norms are allowed access to opportunity, while those who challenge or disrupt it are pushed out. This cultural codification of goodness serves the function of elite capture, ensuring that the same students — those who already mirror the dominant elite — remain in power. At the same time, those who might challenge it are filtered out early.

To resist this, we must reimagine what it means to be good, not as silent compliance, but as critical, culturally grounded engagement. We must affirm that a student who questions injustice, who speaks from lived experience, who brings creativity and emotion into learning, is not a "problem" but a thinker. A scientist. A leader. A visionary. Unless our classrooms adopt these more comprehensive definitions of ability and goodness, they will continue to serve as filtering mechanisms that perpetuate elite dominance and deprive our communities of their brilliance.

Science, in the American educational imagination, has long been constructed as the intellectual property of White people—a protected domain policed by racialized and ableist systems that simultaneously position Black boys as outsiders to academic excellence. Within this framework, White people function as the elites—not only economically or socially, but intellectually—maintaining ownership over what counts as "real" knowledge and who is permitted to access it. This elite status is not coincidental; it is intentional and systemic, rooted in a long history of exclusionary practices that render Black boys hypervisible in punishment and athletics but invisible in science and academic achievement. My dissertation, which explores the science experiences of African American male students in both general and special education, lays bare this elite capture of educational opportunity.

In the classroom, Elite Capture manifests through daily practices that prevent Black boys, especially those labeled with disabilities, from meaningfully engaging with science content. In my school, special education students are often pulled out of core content classes, including science, for “support” that frequently lacks rigor or alignment with grade-level standards. This separation is not supportive; it is subtractive. It ensures that these students do not receive the same depth of instruction as their general education peers, thereby reproducing their marginalization. This structural exclusion is compounded by the fact that these students graduate with a special education diploma, a credential that signals to elite colleges that they are undeserving of access. Their future is predetermined by systems that track them not toward STEM degrees or PhDs but toward low-wage labor, surveillance, and incarceration.

DisCrit offers a critical lens for understanding how race and dis/ability intersect to deny Black boys opportunities to be seen as competent learners. Special education is often used as a mechanism of control, a way to pathologize and manage Blackness under the guise of academic support. This finding is consistent with the results of my dissertation, which showed that special education students had fewer opportunities to engage with high-level science content and were rarely enrolled in AP science courses. Notably, no special education student at my school has ever taken AP Physics, a course reserved for students hand-selected by the teacher based on grades alone, a gatekeeping process that privileges students with pre-existing academic advantages and ignores the ability of others.

Elite capture is not only enacted by policymakers or curriculum developers; it is maintained by educators, often unintentionally, who reinforce the belief that intellectualism looks and sounds a certain way. This is why the basketball court becomes the only place where Black boys are recognized as talented, disciplined, and intellectually engaged. On the court, they are praised for their strategy, leadership, and mental agility, skills that are deeply intellectual but rarely acknowledged as such in the classroom. The irony is that Black boys are permitted to be brilliant in sports but are denied access to brilliance in science. Even within athletics, the power structures remain intact; most coaches are White men who occupy roles of authority and surveillance, dictating the conditions of participation and advancement. They are the elites within this alternate arena, reinforcing the notion that while Black boys may play the game, they can never own it.

This tension between exclusion from the classroom and conditional acceptance on the court reveals a powerful contradiction in how Black male students are perceived and positioned within schools. The science classroom, then, becomes not just a site of learning but a battleground of representation, access, and power. For Black boys, particularly those in special education, it is a place where their intelligence is questioned, their potential is stifled, and their future is negotiated by people who often do not look like them, understand them, or believe in them.

By using DisCrit and Elite Capture, my dissertation interrogated these mechanisms of exclusion and challenged the assumption that underachievement is a reflection of student ability. Instead, it reveals how systemic practices, including tracking, diploma stratification, and the misallocation of special education services, operate to maintain educational inequality.

6.2 Impacts on Future Aspirations

After graduation, students' high school science experiences directly influenced their interest in pursuing science-related fields. The lack of exposure to STEM careers, minimal encouragement from teachers and counselors, and feelings of alienation in science classrooms contributed to a general disinterest in science as a viable path. For many special education students, this disinterest was compounded by the stigma of their IEPs and limited access to resources that could foster STEM engagement.

However, students with access to positive role models, personalized support, or tutoring expressed greater optimism about continuing in science-related fields. This demonstrates the potential for systemic change to disrupt inequities by prioritizing culturally responsive teaching, mentorship, and equitable resource distribution.

6.3 Limitations

One limitation of this study was the small sample size, which included only five student participants. While their insights were valuable, a larger sample could have provided a broader range of perspectives and a deeper understanding of the experiences of African American male students in science education. Additionally, challenges in recruiting students from special education settings may have limited the study's ability to capture the nuances of their experiences fully.

The timing of data collection, primarily conducted during the summer break, presented another challenge. With participants on vacation or engaged in other commitments, follow-up opportunities were limited, potentially affecting the depth of reflection on their school-year experiences.

Additionally, interviewing teenage Black boys posed unique challenges, as some participants struggled to articulate their experiences in detail or explore the broader systemic factors influencing their engagement with science. This was particularly challenging when writing the findings, as although I had well-developed questions, the responses lacked depth. Expanding the study to include additional stakeholders, such as more educators and administrators, to hear their perspectives on the special education process could have provided a more comprehensive view of the structural barriers affecting these students.

Finally, the study's focus on schools in underserved urban communities, while intentional, may have limited comparative insights from other educational contexts, such as suburban or rural schools, where resource availability and instructional approaches might differ.

6.4 Implications

Implications for Practice and Policy

The findings underscore the critical need for educational systems to address the intersecting impacts of race, disability, and systemic inequities on African American male students' science education. Through the lens of DisCrit, the study highlights the importance of dismantling ableist and racist structures that marginalize these students. Meanwhile, Elite Capture provides a framework for critiquing how resource allocation and policy priorities disproportionately benefit privileged groups, thereby further entrenching educational inequities.

Schools can address these disparities by implementing culturally responsive teaching practices, increasing access to engaging science activities and fostering an inclusive and supportive learning environment. Ultimately, these changes are essential not only for improving the science education experiences of African American male students but also for empowering them to envision and pursue futures in STEM fields.

Implications for Future Research

The theoretical frameworks guiding this study —DisCrit and Elite Capture —help shape the implications for future research. While previous literature has explored African American students' experiences in science education and special education separately, my findings suggest critical intersections that remain underexplored. This study highlighted the barriers African American male students with IEPs face in accessing quality science education, including resource disparities, exclusion from advanced placement courses, and culturally disconnected instruction. Given these findings, future research should build on existing literature by addressing the following key areas.

The findings of this study suggest several important implications for future research. First, future studies could examine how different cultural identities within the African American community, such as Afro-Caribbean or African immigrant backgrounds, shape experiences with science education and special education. Rahming (2022) conducted a study on the cultural identities of Afro-Caribbean women and their impact on STEM success. However, my search has not revealed any studies on how the identities of Afro-Caribbean or African immigrant men shape their experiences in science and special education. Additionally, research should investigate the structural disparities in resource allocation that limit access to engaging science education, advanced coursework (e.g., AP science), and extracurricular STEM opportunities in underserved schools. This includes exploring how policies around standardized testing and accountability disproportionately affect African American students, particularly those in special education, and identifying alternative assessment models (Esch et al., 2012; Haynes & Stewart, 2016) that promote equity.

Another critical area for research is investigating the long-term impact of high school science education on students' pursuit of STEM careers. More studies, such as those conducted by the National Center for Education Statistics (NCES), could track students through college or vocational pathways to understand how early science experiences, including media exposure (news, television programs, and social media about science), shape their future aspirations. Similarly, future studies could examine how early interventions (Ash et al., 2021; Daugherty et al., 2014; DeJarnette, 2012), such as middle school science programs, influence high school science education readiness, particularly for students with Individualized Education Plans (IEPs). Research should also explore how mentorship, community engagement, and school support systems influence students' persistence in STEM fields.

The concept of Elite Capture provides a valuable framework for future research to explore how access to advanced courses and resources in science education is concentrated among privileged groups. Using science education as a case study, researchers could examine strategies for redistributing these opportunities more equitably and study how Elite Capture manifests in resource allocation across urban and suburban schools. Furthermore, policy-oriented research could address systemic inequities in science education by increasing funding for urban schools, improving teacher diversity, or reforming standardized testing practices. Advocacy strategies for parents and educators to push for equitable resources and culturally relevant curricula in underserved schools also merit further investigation.

Curriculum design represents another promising avenue for future research. Researchers could develop and test science curricula tailored to the needs of African American male students in special education, emphasizing hands-on learning, cultural relevance, and connections to real-world issues. Studies might also explore how integrating African American contributions to science into the curriculum influences students' engagement and perceptions of the subject. Additionally, research could examine the role of historical awareness in science engagement, investigating whether learning about past scientific injustices (e.g., the Tuskegee Experiment) influences students' trust in science institutions and their willingness to pursue STEM careers.

Finally, broader applications of DisCrit and Elite Capture frameworks warrant further exploration. Future research could examine how societal perceptions of disability and race influence educational policies and practices beyond science education. Additionally, studies could investigate how elite capture operates in other areas of education, such as technology access, extracurricular opportunities, or arts education, to understand better and address systemic inequities. Furthermore, research should explore how teacher training and professional development influence educators' ability to support African American male students in science classrooms, particularly those in special education. These avenues of research could contribute to a more equitable and inclusive educational landscape for African American male students.

6.5 Conclusion

This study examined the science education experiences of African American male high school students, both in general and special education, to explore their perceptions, engagement, and the factors influencing their success in science. Utilizing Dis/ability Critical Race Theory (DisCrit) and Elite Capture as theoretical frameworks, the findings revealed the complex intersections of race, disability status, and systemic inequities that shape students' educational experiences and their perceptions of science education.

The findings highlight the duality of student experiences, with positive perceptions stemming from supportive teacher-student relationships and negative perceptions largely driven by culturally disconnected curricula, limited access to resources, and the systemic barriers that shape their educational pathways. While students appreciated teachers who provided personalized support, flexible deadlines, and prioritized understanding over standardized assessment, they also expressed frustration with the lack of cultural representation in science education, inadequate hands-on learning experiences, and the absence of meaningful exposure to STEM careers. These issues were particularly pronounced among special education students, who faced additional obstacles due to systemic educational inequities and the stigma associated with IEPs.

This study also underscores the broader structural barriers that limit African American male students' access to quality science education. The exclusion of special education students from advanced coursework, the resource disparities in underserved schools, and the overwhelming emphasis on standardized testing all contribute to disengagement from science. These inequities are not just challenges within individual classrooms but are deeply embedded in educational policies and institutional practices that disproportionately benefit privileged student populations. Through the lens of Elite Capture, the study demonstrates how systemic resource hoarding and policy prioritization perpetuate disparities in science education, further marginalizing African American male students, especially those in special education.

The implications of this study are clear: there is an urgent need for educational reforms that prioritize equity and inclusion. Schools must adopt culturally responsive teaching strategies, expand access to engaging and hands-on science learning opportunities, and dismantle exclusionary practices that limit the participation of African American male students in advanced science courses. Furthermore, policies should focus on providing early interventions, alternative assessment models, and mentorship programs that support students' long-term engagement with STEM.

Future research should further investigate the intersections of race, disability, and science education by exploring the experiences of Afro-Caribbean and African immigrant students, analyzing long-term STEM career trajectories, and examining the impact of early science interventions. Addressing these gaps will contribute to a more comprehensive understanding of the systemic barriers faced by African American male students and inform strategies to create more equitable science education opportunities.

Ultimately, transforming science education for African American male students requires not only policy changes but also a shift in educational practices that center students' cultural backgrounds, lived experiences, and individual learning needs. By addressing these disparities, educators and policymakers can help foster a more inclusive and empowering science education landscape that encourages all students to envision and pursue futures in STEM.

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Appendix A

Participants (General and Special Education) Interview #1

1. Let's start with you telling me a little about yourself.
2. Can you give me some examples of your least and most favorite courses in school right now?
3. Can you tell me a time when these courses were not your least or most favorite?
4. What sparked your interest in science? (If science is one of the participants' favorite). Can you give me an example of a particular event or experience that made you curious about the natural world? OR Can you give me an example of an event that made you not interested or dislike science?
5. How do you feel about your current science classes? Are there aspects of the curriculum that you find particularly engaging or challenging?
6. Have you ever felt discouraged or unsupported in your pursuit of science education? If so, can you describe those experiences?
7. Are there any barriers you face in your science education, such as access to resources or opportunities?
8. Have you had any memorable experiences in science, such as a particularly exciting experiment or project?
9. How do you think your background or identity influences your experiences in science?
10. Can you share a specific example of a time when your background or identity impacted your experience in a science class or activity/project?

11. Do you feel your school provides enough support for students interested in science? If not, what improvements would you suggest?
12. Have you ever had a science teacher who significantly impacted your learning? What did they do that was so effective?
13. How do you think science education could be improved to better meet the needs of students like yourself?
14. What are your aspirations for the future, and how do you see science playing a role in achieving those goals?
15. Imagine you have the opportunity to create the perfect science teacher. This science teacher can be anyone you want them to be and have any qualities, skills, and characteristics you think are important. Now draw this science teacher.
16. Are there any scientists or engineers you look up to? Who are they and why?
17. Do you see people who look like you represented in your science textbooks or lessons?
18. How important is it for you to have a teacher or role model who shares your racial or cultural background in science?
19. Are you involved in any science clubs, competitions, or extra curricular activities? If so, which ones?
20. How do these activities influence your interest in science?
21. What types of science-related activities do you enjoy outside of school?
22. Do you see yourself pursuing a career in science or a related field? Why or why not?
23. What kind of support of resources do you think would help you to achieve your science related goals?
24. How do your family and friends view your interest in science?

25. Do you feel there are any stereotypes or biases you face as a Black student in science?
26. How do societal issues, such as racial inequality, impact your interest or involvement in science?
27. How do you think schools can better support Black boys in pursuing science?

Questions for the Special Education boys only

28. How do you think being in special education affects the way others see you?
29. Do you feel comfortable talking about being in special education with your friends or family? Why or why not?
30. Have you ever been excluded from any activities or opportunities because you are in special education?
31. Do you feel that being in special education limits your future career or educational opportunities? How?
32. How do your interactions with teachers and school administrators differ from those of students not in special education?
33. Have you experienced any bullying or discrimination because of your special education placement?
34. Do you feel you have adequate support from your school to succeed academically and socially? Why or why not?

Appendix B

Interview Protocol

Focus Group for General Education boys.

1. Compare the neighborhoods where you attended school from elementary to middle to high school. Were there any differences in the quality of education received? Explain.
2. Have you ever been in an all-inclusive classroom (classroom mixed with IEP students)? How did that make you feel?
3. How would you describe your overall experiences with your science classes so far? Are they different from other subjects you've taken? Why or why not?
4. How do you feel your current science classes are preparing you for the future?
5. Have you ever felt that stereotypes or biases have affected your experience in science education? How did you navigate or respond to those situations?
6. Do you feel that teachers or peers have certain expectations of you when it comes to science? If yes, how do those expectations affect your participation or success?
7. Do you feel supported in your science classes, whether by teachers, classmates, or the school itself? What kind of support do you think is necessary for Black students to succeed in science?
8. How important is it to you to be taught by a Black male teacher as opposed to a female or a White male? Explain.
9. What do you think schools could do better to encourage more African American males to pursue science-related careers?
10. Do you think that your school places a strong emphasis on grades as opposed to student learning/ understanding? Explain.

11. How have your science experiences in science classes influenced your decisions about whether or not to pursue a career in science? What are some specific factors that have shaped your decision?

Appendix C

Interview Protocol

Focus group for Special Education boys

1. Can you describe what your experience has been like in your science classes? What do you like and what do you find challenging?
2. How do you feel when you're in your science class? Do you feel like you belong there? Why or why not?
3. What kind of help or support do you usually get in your science class? Do you feel that it's enough for you to succeed?
4. Have there been moments when you felt like you need more support in science? What were those moments like?
5. How do the accommodations you receive in special education help you in your science class? Are there any accommodations that you think would help but you aren't receiving?
6. Are there times when you feel your special education label affects how others treat you in science class? How do you feel about that?
7. How do your science teachers interact with you compared to other students? Do you think they have different expectations for you?
8. What's something a science teacher has done that made you feel confident or capable? What's something that made you feel discouraged?
9. Can you think of any science topics that feel relevant to your life or your community? How do those topics make you feel about science in general?

10. What would make science more interesting or enjoyable for you? Is there anything you wish your science teacher did differently?
11. What is it like working with other students in science class? Do you feel included when it comes to group projects or class discussions?
12. Have there been times when your classmates either helped or hindered your learning in science? What happened?
13. Do you see yourself continuing with science after high school, whether in college or as a career? Why or why not?
14. What could schools or teachers do to make sure students like you feel more excited or confident about pursuing science in the future?
15. Do you ever feel that being in special education affects how you see yourself as a science student? In what ways?
16. How does being an African American male in special education shape your experience in science class, if at all?

Appendix D

Interview Protocol for Special Education Teachers

1. How long have you been a teacher in the public school system?
2. Have you always been a special education teacher?
3. Could you explain what are some of your roles as a special education teacher?
4. Could you give some more clarifying information on what an IEP is and how does a student get one?
5. Do you always agree when a student is recommended to be evaluated? Why or why not?
6. Can you describe your experiences teaching African American male students in special education, particularly in science? How do their experiences compare to those of other students in your classroom?
7. How do you think race and disability intersect in shaping these students' experiences in science education?
8. Do you believe that African American male students in special education have access to the same resources and opportunities in science education as their peers? Why or why not?
9. How do you navigate the allocation of resources and support for these students, particularly in science classrooms?
10. How do you foster an inclusive learning environment for African American male students in special education, especially in science? Can you share specific strategies or challenges?
11. Are there any barriers to including these students in general education science classes? How does the current structure support or hinder their inclusion?

12. How do you adapt the science curriculum to meet the needs of African American male students in special education? Do you find the curriculum flexible enough to address both racial and disability-related challenges?
13. How do you think the science curriculum could be more culturally responsive or inclusive of the experiences of African American male students in special education?
14. Have you noticed any differences in how African American male students in special education are perceived or treated compared to their peers? How do you work to challenge or address any stereotypes in the classroom?
15. Do you think societal expectations about race or disability influence how African American male students in special education are treated in science classrooms? How do these expectations affect their performance?
16. How do you feel supported by the school administration in providing a quality science education for African American male students in special education? Are there any barriers to receiving the support you need?
17. Do you think there is a gap between what is expected of special education teachers and the resources provided to ensure African American male students succeed in science?
18. How do you engage with the parents of African American male students in special education to support their learning, especially in science? Are there particular challenges in this relationship?
19. In your experience, do parents of African American male students in special education advocate for their children's science education? How do their concerns or challenges differ from those of other parents?

20. In your experience, what systemic barriers do African American male students in special education face in accessing quality science education? How do these barriers impact their learning and outcomes?
21. How do school policies, particularly those around special education, impact Afri African American male students? Do you feel these policies are equitable, or do they favor certain groups over others?
22. How do you think the label of "special education" and the racial identity of being African American influence how these students view themselves, particularly in science education? Have you observed any effects on their confidence or engagement in science?
23. In what ways do you see the intersection of race and disability influencing students' participation or disengagement in science learning?
24. What changes do you think are necessary in special education or science education to better support African American male students? How can schools better address both racial and disability-related challenges in these students' science experiences?
25. If you could change one thing about the way science education is delivered to African American male students in special education, what would it be and why?

Appendix E

Interview Protocol for Parent

1. Could you tell me a little about yourself and your family?
2. At what age did your child receive an IEP?
3. Did the suggestion to evaluate come from you or the school?
4. Was the teacher Black or White?
5. Was the school a public school? In Brooklyn?
6. How did you and your family feel about him having an IEP?
7. Was the whole process explained to you clearly?
8. Were you involved in the entire process? All the decision making?
9. What is his category?
10. Do you agree with this placement? How do you feel about it?
11. What information has his teachers, or the school provided you about how long he would have this IEP?
12. Are you aware of what his diploma would say once he graduates school with an IEP?
13. Have the school/ teachers ever suggested your child getting tested out from the IEP?
14. Do you feel that your child benefited from having an IEP? He received all the educational opportunities as other students.
15. Can you describe your son's overall experience in school, particularly in science classes? How do you feel his experiences differ from other students who are not in special education?
16. How has your son's identity as an African American male influenced his experiences in the classroom, especially within special education settings? Do you believe your son has access

to same resources and opportunities in his special education as other students who are not in special education? Why or why not?

17. In what ways, if any, have you noticed a difference in the quality of instruction or resources available to your son compared to general education students?
18. How have your son's science teachers or other school staff supported his learning, both as a special education student and an African American male?
19. Have there been moments where you felt that teachers or staff had lower expectations for your son because of his special education status or race? How did you address those situations?
20. Do you feel that your son's placement in special education has impacted his ability to interact with peers who are not in special education? How does this affect his experience of learning science?
21. How has being labeled as a special education student affected your son's self esteem and his interest in science? Have you noticed any changes in how he views himself as a learner, particularly in science?
22. How do you think societal perceptions of disability and race have shaped your son's science education experience?
23. Have you had to advocate for your son's needs in science classes or other areas? Can you share an example of how you navigated this process?
24. Do you feel that your input as a parent is valued by the school when decisions are made about your son's education, particularly in science? Why or why not?

25. In your experience, how do race and disability intersect to create additional challenges for your son’s success in science?What are your hopes for your son’s future in science education? How do you see his experiences in school helping or hindering those goals?
26. What changes would you like to see in how science education is delivered to African American male students in special education?
27. In what ways do you believe the school system could better support African American boys in special education, particularly in science classes
28. If you could change one thing about the way science education is delivered to African American male students in special education, what would it be and why?