# “OF THE COMING OF JAMES”: A CRITICAL AUTOETHNOGRAPHY ON TEACHING ENGINEERING TO BLACK BOYS AS A BLACK MAN

by

**James S. Holly, Jr.**

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# THE PURDUE UNIVERSITY GRADUATE SCHOOL
# STATEMENT OF COMMITTEE APPROVAL

Dr. Morgan Hynes, Chair
School of Engineering Education, Purdue University
Dr. Kerrie Douglas
School of Engineering Education, Purdue University
Dr. Alice Pawley
School of Engineering Education, Purdue University
Dr. Christopher Wright
School of Education, Drexel University
Dr. Stephanie Zywicki
College of Education, Purdue University

**Approved by:**

Dr. Brent Jesiek
Head of the Graduate Program

*I love you free, with no desire to hold your wings*
*I'll just fly beside and hear them sing*
*Then cut the strings off all your dreams*
*Just to show you how*
*I love you*
*Free*
*Excerpt from "Black Boy I love you free" by Chanel Beebe*

*This project is dedicated to black boys, my prayer is that someone loves you free. This work is also dedicated to all the little homies (black boys and girls) I've mentored, taught, and played with throughout my life, you helped me discover my purpose and passion. Your laughter, your smiles, your joy gave me what I needed to do this work.*

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Aunt Deloris Alexander
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Community
Young Vets
Porscha Echols
Campus Outreach Community

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Gill family
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Dr. Percy Pierre
Dr. Ahmed Naguib
Diversity Programs Office
College of Engineering K-12 Office
Center for Engineering Education Research (CEER)
Black Graduate Student Association (BGSA) Community
Collegiate, Black, & Christian (CBC) Community

**Detroit**
Clark family
Holly family
Dennis Talbert
Ms. Pagan
Rosedale Park Baptist Church family
The Table
East English Village Preparatory Academy Community

**Greater Lafayette Area**
Minority Engineering Program (MEP) Community
Black Cultural Center (BCC) Community
Black Graduate Student Association (BGSA) Community
Intervarsity Christian Fellowship Community
Engineering Education Community
African American Studies Community
Center for Intercultural Learning, Measurement, and Research (CILMAR) Community
Office of Institutional Research, Assessment, and Effectiveness Community
Second Baptist Church (SBC) Community
Hartford Hub Community
Aunt Michelle & Uncle Andrew
Pauline Shen, Heads Up Community
Pastor Rodney Lynch
Pastor James Foster

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# ABSTRACT

Author: Holly, Jr., James, S. PhD
Institution: Purdue University
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Committee Chair: Morgan Hynes

In W. E. B. Du Bois' *The Souls of Black Folk* there is a story entitled "Of the Coming of John" that features two boys named John, one black from a poor family, the other white from a wealthy family. As the two are away at college each family awaits 'of the coming of John,' the title is also a reference to maturity because black John becomes disillusioned with race relations as he is awakened to the injustices that seemed so normal. Like black John, I too went to college far away from my hometown, developed a heightened awareness of society's racism, and retained a desire to return home to teach youth in my community. And like black John, I want to teach by implementing a pedagogy that promotes equity for black Americans amid inequitable conditions.

The research problem addressed in this study relates to the absence of sociopolitical teaching practices in K-12 engineering education, which I argue is necessary for equitable inclusion of underrepresented racial/ethnic minorities in general, and black males in particular. Black Americans are plagued by racial inequities that transcend all domains of societal living (e.g., economics, education, health, etc.); this lamentable reality is the direct result of historical disenfranchisement of this racial group within the United States. Therefore, engineering must be taught with pertinence to the social, political, and cultural realities of the pupils. This self-study was an investigation into my story of living as a black male and studying engineering, and how my experience (along with my sociological understanding of other black males) shaped the way I

taught engineering to black boys. Critical autoethnography was used to articulate the cultural and experiential knowledge that guided my instructional methods. Black Critical Theory, an offshoot of Critical Race Theory, served as one theoretical framework for this study because it centralizes the prevalence of anti-blackness as a lens to understand the experiences of black citizens. African American Male Theory is a complementary framework as it takes a broader ecological perspective to analyze the experiences of black male citizens. Taken together, these frameworks reveal the distinct features of American life negotiated by black males.

Resultantly, my life events led me to merge black racial identity, black politics, and the dynamics surrounding the education of black boys to teach K-12 engineering within a critical race pedagogical framework. I was socialized to be present and authentic among the people I want to lead and serve, hence, my devotion to community-engage scholarship. I grew tired of watching educators give-up on black students or become volatile, therefore, I spent time with the hyper-marginalized to build up the requisite resilience to avoid dysfunctional teaching and a cynical demeanor. I have felt undervalued and left-out in some classroom experiences, so I prioritize connecting with students over presenting content. I've witnessed engineering educators ostracize and belittle students unwilling to assimilate to its cultural norms, contrarily, I taught black boys with the goal of making engineering relatable to them, not vice versa.

# PREFACE

## Educational-Background Narrative

### Elementary School

My strongest early memories of my educational experiences are at the elementary level, I attended Kindergarten but don't recall much except where I attend. The school was Paul Robeson Academy (now Paul Robeson Malcolm X Academy) and is known as the first public school program in the United States to have an African-centered curriculum, where I slightly remember learning and reciting the components for the celebration of Kwanzaa. I attended Spain Elementary/Middle School for first- and second-grade. I had a remarkable teacher during that time, and we remain in contact to this very day, Ms. Pagan. Ms. Pagan managed her classroom with a unique balance of being strict and compassionate. Learning was enjoyable, and she trained us to think of our classmates as family, rather than just peers or even competitors. Ms. Pagan's class was the first and last time I achieved all 'A' grades for every marking period. I excelled and was even considered for grade promotion, but my mother declined the opportunity because she didn't want me to "miss anything." Ms. Pagan fostered rich relationships with her students (and their parents) within and beyond the classroom setting, including visits to her house and trips with her to the local fruit market; moreover, she was impartial, treated us as her own children whether we performed excellently or poorly on classwork, and in life in general. I remember thinking of myself as intelligent and very capable academically.

For third-grade, I attended Horace Mann Elementary School because my mother, sister, and I move to a different part of the city. I don't remember much about my third-grade schoolyear besides feeling isolated since I hardly knew anyone in my class for most of the year.

We were assigned daily "bell-work," meaning after the bell rang for the day to start we would spend the first few minutes of class writing in our journals answers to some prompt on the board, and then spend time sharing with the class if we desired. At this point my interest in doing well began to shift as I became more concerned about my social status. I remember one of my classmates was the most popular boy in the class, he was considered handsome and a good basketball player, but he was failing his schoolwork. That apparently didn't matter to his girlfriend, the most physically attractive girl in the class, and his friends who followed his influence. These things informed my perspective on what mattered to my peers.

For fourth- and fifth-grade, I attended Harriet A. Marsh Elementary School, which is now closed (Paul Robeson and Spain were closed at some point but are now re-opened). During my time at Spain I walked a few blocks to school, at Mann I walked a bit longer, and Marsh was the farthest I traveled to school up to that point. Given my shifting focus toward social interactions and the amount of travel time I spent with my peers, peer influences had a significant role in shaping my perspectives at this time. In elementary school, we were eligible to try-out for the school's team until we were in the fourth grade. Until then you could only show your ability during recess or after school. I didn't know any kids at Marsh before I arrived, but I easily integrated due to my ability to play basketball. My main teacher, Mr. Deadmon, was also one of the basketball coaches and he pushed us hard in both spaces. He challenged us to perform well academically and was very unforgiving, yet we respected him, mostly out of fear.

During these formative elementary education years, there was not much formal racial or cultural education, possibly because in each context I existed the dominant (and sole) race and culture was black. Education was proclaimed as the key to life success and escape from the harsh conditions in which we lived, the way to achieve whatever it is that we wanted. For me, growing

up in a single-parent home, my mom worked a lot and my sister and I didn't talk about school much, so my academic development took place primarily at school. I had no real intention of being a professional athlete, but I was athletic and particularly skilled in basketball, which helped me stay relevant socially and form friendships. I can't recall the grades I earned, but they were generally average (C+) or just above average. I did not work diligently or push myself to excel academically after the second-grade. This was largely because of my shift in focusing on my social status among my peers rather than on my academic performance. I wanted to be "cool," and earning good grades didn't get anyone any "cool points" among other kids. Despite encouragement from my mother and other adults to do well academically, at that time my peer group became my biggest influencer.

**Middle School**

Bates Academy is the middle school I attended for three years and is considered a magnet school. I remember a lot about my time at Bates, most, but not all, good. Middle school, for me was heavily centered about my social engagement and identity formation. While there were classes I enjoyed, I mostly did whatever was necessary to "get by." By this time, school was just a social setting to me. I was not defiant and did what I was told, but there was sort of a culture that your potential was determined by your natural ability. I don't recall any teachers or administrators actually saying that explicitly, but that's how it felt. Students that performed well academically received a lot of attention and were frequently engaged and praised by teachers, while those who didn't could float by largely unnoticed. Students that misbehaved were often favored as well, and it mostly seemed like based on what teachers 'liked' or 'didn't like' you dictated how you were treated, unless you didn't make much of an impression and then you were largely ignored.

A few teachers stand out in my memory of middle school, one being an elderly white woman whose name I cannot remember. She taught my English class (not sure which grade), and she was, I believe, the first white teacher I had experienced, and only one until high school. She was very harsh, in how she spoke to us and graded our work. Most kids just mocked her and showed disrespect, but she stands out because I wasn't convinced she cared much about us or our learning. Another teacher I think of is Ms. Quinn. I don't remember all the classes I took with her, but I remember being interested in the topic of debate until I took her class. She had obvious favorite students and in no way managed her class fairly. I also did not enjoy being in her class because she didn't like the way I wrote the letter 'q' and would *always* badger me about it. Thirdly, Ms. Colson, who was my seventh-grade science teacher and assistant basketball coach, managed her classroom impartially while challenging us to perform well academically in a class few of us found any bit of interesting. I enjoyed her personality more than the class content, and her ability to demonstrate concern for all her students and encourage our intellectual potential. I can think of a few times she spoke with my mother during parent-teacher conferences about my underperformance. I had a 'C' in her class, but she felt I could do much better.

Due to the reputation of Bates, teachers and administrators certainly had an expectation that most of their students would attend upper-tier high schools and colleges. For me, however, I was more concerned about extra-curricular activities and having fun. Which is probably why I don't have hardly any memories of doing homework or studying outside of school hours. It's a weird realization. There were three high schools that were considered to be the best public-school options for a high-quality educational experience: Renaissance High School, Cass Technical High School, and Martin Luther King, Jr. Senior High School. While each of these schools' current status would be seen as much less than many years ago, Cass and Renaissance

are still considered the best two public school options in the city of Detroit. Each year at Bates, the eighth-graders would take a placement test to see which of these three schools we were eligible to attend based on our performance.

I didn't get into Renaissance but did well enough for the other two, so for most of my eighth-grade year I figured I'd be attending Cass Tech for high school; however, someone suggested to my mother that she look into University of Detroit Jesuit High School (UofD), a private all-boy Catholic school near the northwest borderline of the city. My mother asked if I was interested, and I said I'd go if she wanted me to. UofD was (and still is) considered an "academically rigorous" school that prepared boys to be successful in college and life more broadly. I took their placement test and did decently enough that they asked me to re-take the math portion before they made an admission decision. I re-took the math portion of the test and did better, after which they admitted me and provided tuition assistance for my mother to afford my enrollment.

**High School**

Attending UofD was the first time I was a racial minority in school, or really in any setting I regularly participated in (aside from the broader U.S. population). I don't exactly remember how I felt starting out at the school, but I remember how I felt while there. Racial prejudice was rampant, though largely discreet. I never had any experiences of overt discrimination, but I *always* felt a sense of discomfort and performance (performing an expression my identity, not my true self). Black students from the inner-city mostly interacted with each other, and those from suburban areas felt most comfortable around white students. The ostensible environment was friendly and inter-racially harmonious, yet among the black students we would often talk about disrespectful comments and actions made by teachers, administrators,

and other students. Before I knew microaggression was a term, that's essentially what I experienced abundantly during my high-school years. I participated on many athletic teams and would be regularly applauded for my athletic performance by white students, but that was the full extent of most of my relationships with them. On the other hand, I didn't fully relate to the other black students either. I felt a cultural disconnect with their music interests, leisure activities, and general conversational topics, so though I felt more relatable to the other black boys I sometimes felt as if I was navigating two settings.

During this time, I started to think a lot about race relations and other racial dynamics in society. Most, but certainly not all, of the white kids were fairly wealthy, while most of the black kids were receiving financial aid to attend the school. I remember, very distinctly, spending many days begging for a few dollars from other students to be able to purchase something for lunch. Often, this resulted in only scrounging up enough change for a bosco stick and the process was humiliating. I was desperate, so I didn't mind as much people telling me 'no' when I asked, even if I thought they had extra money, but it was more the arrogance some boys displayed that was difficult to endure. We had a dress code, which seemed a natural fit to the wardrobe of the white students, while the black students seemed to be playing dress-up. Despite being a small percentage of the school population, black students were well represented in after-school detention. Nevertheless, I adapted. I was exposed to clothing brands and ways of dressing I had not been previously familiar with, in some ways this was helpful as I learned how to select the appropriate style of dress for varying occasions (formal, semi-formal, etc.). I realized some of my peers in public school settings were not forced to learn such things in their school setting. I was exposed to the vastly different worlds black and white folks live in. The places white students shopped, where they sought recreation and entertainment, their interests and concerns,

and so on, were very different from my own, as well as other black students. Some black students assimilated and began to learn their cultural norms, while I always struggled to find some sense of normalcy or trying to do enough to get through without losing myself.

Academically, the school was challenging, providing lots of homework and assignments. Each teacher assigned work as if the other teachers did not exist or were not providing a similar workload; this always frustrated me. I struggled throughout. I felt like I could do better but was not motivated to improve. It was not until my junior year that I decided to elevate my academic performance, partially out of maturity and just a desire to represent myself and my capabilities better. Despite doing pretty well my final two years, I couldn't rescue my grade point average (GPA) and managed to graduate with a 2.69 GPA. That was obviously not helpful for college admission but what was interesting to me is that I scored a 25 on the ACT (nothing special) yet that was much better than many of my peers with 4.0s or better in public schools! Something was off to me, students working hard in public schooling performed poorly on standardized tests (essentially the gatekeeping mechanism to college admission), while a student who did just enough to get by in a private school was more prepared to enter the college arena. Maybe no big deal, if not for the majority of public-school students being black and the majority of private school students being white.

My dad worked as a career counselor in a public school at the time of my junior year and he suggested I go on a Historically Black College/University (HBCU) tour. I didn't know much about HBCUs at the time but given my high school experience in a predominantly white setting I was open to it. I had a great sense of distrust regarding white people, feeling they knew how to "play nice" but I was always unsure of how they really felt. Whereas, there were issues I had with some aspects of black culture and many more I loved, but at least I knew what and who I

would be involved with. With renewed interest in developing my intellectual potential, I was seriously hopeful that in spite of my low GPA I could gain some financial assistance and attend college somewhere.

I didn't know much about the actual college experience, but it seemed like the logical next step after high school. I didn't know much about college majors either, but based on my interest in math and problem-solving, engineering seemed like a good choice. I chose mechanical because the Google descriptions of the other disciplines didn't look appealing. I did another Google search to learn which HBCUs were ranked highest for their engineering program, and that dictated the order of preference of my school choices. I was so intrigued by the vibe and atmosphere of HBCUs on the college tour, I had determined that's where I wanted to go even though all my choices were hours away from my hometown. With my GPA I didn't receive any financial scholarships, so my youth pastor suggested I attend a local college, a reasonable recommendation but I was committed to going away. I was denied admission to my first college choice but admitted to my second choice, so I decided that's where I'll go (I never applied to the third choice). Tuskegee University's (TU) tuition was completely unaffordable for us, so my mother and I made calls to the university trying to speak with anyone that would help us. Eventually we were able to get someone to put together a loan package for me, and then we headed to Tuskegee, AL.

**Undergraduate Studies**

TU is thirteen hours from Detroit, and I had no family anywhere near the school, but that didn't bother me. I think because since elementary school I always had some level of independence, which increased as I got older, I felt comfortable going far away on my own. Notwithstanding, my intention was to return to Detroit after college to work and serve my

community. At this point in my life I had become aware of the overwhelmingly impoverished condition of many black families, and the dearth of positive role models and black people willing to assist other black people in improving their lives. I felt a social responsibility to return home and invest in the development of youth, specifically black males, and leverage my skills and resources to support the growth of the black community.

TU was extremely influential in my racial, Christian, and scholarly identity development. Despite growing up in a predominantly black city, I hadn't witnessed such diversity among other black people to the degree I experienced at TU. I considered myself pretty fortunate to be at an institution of higher education and seeing some many students that were serious about their academic achievement along with professors who pushed us and expected excellence (some not all) really motivated me to work harder. I didn't have anyone helping me to navigate the collegiate experience, so I had to leverage my social networking skills to become aware of resources and opportunities that were available. This led to earning a couple academic scholarships that eased my financial burden, and I formed multiple relationships with faculty members that transformed the way I viewed the professor-student dynamic. Black culture, in my mind, was expanded to include academic and professional excellence. Many professors, the majority of whom were also black, did not simply teach class content but engaged in character development and inspired us to be exceptional.

I participated on the track and field and cross-country teams, along with some time on the basketball team though I didn't officially make the roster. I earned athletic scholarships that increased each year I participated, which in conjunction with my academic scholarships covered my full tuition by my senior year. I also spent a significant amount of time involved with a Christian ministry on campus and a local church, which helped to mature my understanding of

Christian principles. At the local church I attended I spent time informally mentoring some of the younger boys, which I also did at my home church in Detroit. About this time, I began to recognize my passion for youth development, though I was not certain I could make a career out of such work. I felt that even with all the black people I saw and engaged, there was still a disconnect between black folks in the collegiate space and those in urban communities across America.

I owe a lot of the reason for why I became interested in graduate school to Dr. Maria Calhoun. We first met when she was a teacher-assistant in a lab course and then she became a professor of mine. I, like many of my classmates, really enjoyed her classes because she was great at challenging us while promoting deeper learning. She was also very personable as a professor. I recall one day during one of our conversations she said, "you're going to get a Ph.D. someday." I replied with appreciation of her confidence in me but declined as I had no real conception of what a Ph.D. was or what was necessary to achieve it. However, during my senior year I wasn't fully committed to pursuing a career in Mechanical Engineering, so I asked her to tell me more about graduate school, stating I'd be willing to try a master's degree to get a more specified perspective and engagement with engineering. Another professor, Dr. Deloris Alexander, who was also the leader of the college ministry at the local church I attended was very helpful in my journey to graduate school as well. Both women helped me learn about what was necessary to apply to graduate school, and even read and gave feedback on my written statements for my grad applications.

I took the GRE twice, and still only achieved what was considered (unofficially) the minimum acceptable score for engineering students. And the tests were expensive. Fortunately, I received financial assistance from a fellow church couple to help pay for one of the exams. As I

stated before, my desire was to return to Detroit, so my first-choice school was Wayne State University (WSU), which is in Downtown Detroit. I applied to Michigan State University (MSU) as a backup option. WSU is largely a commuter school with most of its students working part-time to help pay for their tuition. I wanted to be a full-time student, but I didn't have outstanding credentials (GPA, test score) so I was admitted but didn't receive any scholarship offer. MSU, a much larger university, accepted me and offered me a teacher assistantship with covered my tuition and provided a stipend. It was a no-brainer where I was going, and MSU was only 1.5 hours from Detroit so I could still visit often.

**Masters Studies**

When I arrived at MSU I felt like a freshman in college all over again. TU had about 2,700 students, MSU had upwards of 45,000; MSU's basketball and football teams competed on national television and there was an abundance of clubs and extra-curricular activities to participate in. The engineering department had a much larger building and multiple computer labs, with each station having two monitors! There were so many aspects of the campus that made me feel like it was the kind of school I saw in movies. On the educational side though, early on I felt like as an institution they were more concerned about quantity than quality. The pace and level of depth in classroom instruction (much lower, emphasis on breadth) was vastly different from what I experienced at TU, so I struggled through most of my time there. I initiated study groups, something we did regularly at TU, but few people signed up and those that did came to the meetings with their homework mostly complete seeking to compare answers; whereas, I was expecting to work through the assignments together. I visited my professors' office hours attempting to build relationships, but they only desired to answer specific questions

I had about assignments and were unwilling to work through any confusion I experienced in understanding the work.

I maintained a GPA below 3.0, which was required to graduate, so I contemplated exiting the program many times. My family and friends were proud of how far I had progressed and urged me to continue, so I committed to staying as long as the university would allow before dismissing me. These were some of the most difficult times of my life. Things were fine regarding social integration, but academically, I have never been so close to failing out of a program, which caused heavy feelings of anxiety and embarrassment. I continued to work hard, but what saved me was other students who were willing to tutor me and help with assignments, and my supervisor for my TA appointment. Dr. Naguib had become the graduate chair after a year of me working under him, so due to my hard work in my TA duties and slight improvements in my grades he advocated on my behalf to his superiors to extend grace and avoid dismissal despite my grades not meeting 'satisfactory' standards. Around this same time, I heard about Purdue's Engineering Education (Eng. Ed.) Ph.D. program, and had determined I would focus on doing whatever is necessary to improve my grades and graduate successfully with the master's degree. Given my newfound interest in Eng. Ed., I searched any preparation opportunities I could find at MSU. Through various networking moves, I learned of an Eng. Ed. course. I took the course, thoroughly enjoyed it, and received an 'A' in the class (the only in my master's tenure) which boosted me just enough to get over a 3.0 GPA making me eligible to graduate.

During the first two years at MSU, I was one of two black students in Mechanical Engineering, and the other black guy was a full-time employee and part-time student. I interacted with the two white guys and Chinese guy in my TA office regularly and we formed decent

friendships, but I connected with the Black Graduate Student Association (BGSA), black Electrical Engineering students via the Sloan program, and two black college ministries for comfort and to feel some sense of belonging. Looking back on it, that was a lot (perhaps too much), but it was what I felt was necessary to avoid feeling totally isolated and psychologically capable to persist with the academic frustrations I was experiencing. I learned a lot about what I now consider racism, but at the time just considered racial hostility, at Historically White Colleges/Universities (HWCUs)[1]. There were multiple incidents of white students painting 'Nigger' on a black student's dormitory door or some random place on campus, and students found a black doll hanging from a classroom ceiling by a string formed to be a noose. Of course, such incidents never occurred at TU, so it was interesting to watch how black students responded with frustration and anger. There were protests, but many didn't feel the administration cared at all. There were many other issues too that help me notice the difference in self-confidence and racial esteem between black students educated at HBCUs and those at HWCUs.

My time at MSU helped me to see I was not interested in a career in engineering. I spent a lot of time volunteering with and working jobs that served youth in the Lansing community. Lansing is a city adjacent to East Lansing, with more black and impoverished residents, similar to where I grew up. These experiences bolstered my passion and commitment to pursue a career in black youth development, specifically black boys. Purdue's Eng. Ed. program seemed like an opportunity to leverage my formal engineering educational experience/training toward youth development since they had a group that focused on K-12 Eng. Ed. What I realized was the critical thinking and problem-solving of engineering attracted me and sustained my interest, and

[1] I use this descriptor instead of the more popular Predominantly White Institution (PWI) to highlight the fact that these schools don't just happen to have more white students, they were erected for white students only, and though blacks fought to desegregate these institutions white supremacy continues to dominate their culture.

that these traits impacted the way I approached non-academic areas of my life as well (e.g., recreation, relationships). So, I figured I could attempt to design a way to foster critical thinking and the way engineers approach solving problems with black boys, as it relates to the difficulties they experience in their social circumstances.

**Storytelling As Scholarship**

The preceding abbreviated account of my educational experiences prior to entering my current doctoral program are provided to give the reader context for the work I will present in this dissertation. The experiences I shared, and my resulting intellectual and character formation, instigated my motivation to do this work, and shaped my approach to crafting this project. This preface also serves as an introduction to the concept of autoethnography, which will be explained in further detail in the second chapter. Two statements on autoethnography summarize for me why this inquiry process is most useful to this project: i.) "Autoethnographers view research and writing as socially-just acts; rather than a preoccupation with accuracy, the goal is to produce analytical, accessible texts that change us and the world we live in for the better" (Ellis, Adams, & Bochner, 2011. p. 273), and ii.) "The process of self-exploration and interrogation aids individuals in locating themselves within their own history and culture allowing them to broaden their understanding of their own values in relation to others" (Starr, 2010, p. 1). I believe using autoethnography was helpful to produce a scholarly document that encourages more equitable teaching by elucidating contradictions in teaching engineering that I recognize as a black man, which others may not be attuned to. Some of these issues I became aware of in my own schooling experience and others arose during this research project.

With autoethnography, I was able to offer a perspective that I believe is absent yet sorely needed, not because I am unique in and of myself, but because the sociohistorical legacy of black

men (like myself) who have studied and are now teaching engineering is largely unknown. The literature I've reviewed simply talks about why/how we (black males) made it or didn't make it through higher education successfully, neglecting our stories of being denied entry into the professional industry even after earning a degree, or accepted only to engage more prejudice and discrimination. Even so, there is a dearth of literature highlighting the experience of a black man teaching engineering, particularly to other black males. I believe speaking from the first-person perspective is necessary to make the case for why I believe racism and systemic oppression should be purposefully present in any effort to broaden participation in engineering to black males, and underrepresented populations in general. Lastly, I believe autoethnography fits well with Critical Race Theory's focus on using personal narrative as an interpretive structure to examine racism in society, except instead of telling the story of others or allowing them to tell their story, I am telling my own story. Autoethnography will allow me to shed light on my teaching process and share the adaptations I made along the way, shortcomings included.

**The Title of This Work**

I originally chose a title for this project that was a reference to two books, neither of which have I read though I have intentions to do so. The first, *The Crisis of the Negro Intellectual* by Harold Cruse (1967) is both a historical account and critique of numerous black intellectuals whom Cruse argues failed to understand how racism is endemic to American society. Further, he suggests entities designed specifically to advance the cultural and economic status of blacks is the only way black Americans will truly progress. The second book, *Crisis of the Black Intellectual* by William D. Wright (2007) is a re-examination of the first book, yet he proclaims what the role of black intellectuals should be today and how they've failed to adequately examine and attend to the condition of the black community, instead opting for

media-provoked hogwash. My ambition was to, in the spirit of these writers, challenge the public and scholarly discourse which has offered reasons for the dismal status of black males in engineering that omit systemic racism. Specifically, in the realm of K-12 engineering education an abundance of initiatives have sprung forth because of calls to broaden the presence (or participation) or black students in engineering, but none that I have seen identify the circumstances that first excluded blacks from participation in the field, or explicitly address the myriad barriers that currently hamper our engagement. That is a crisis to me and as a black male scholar, I saw the connection as my attempting to leverage my intellect toward a new proposed solution in this domain.

However, I eventually decided to switch the first part of the title from *Crisis of the black male intellectual* to *"Of the Coming of James."* In W. E. B. Du Bois' *The Souls of Black Folk* there is a story entitled "Of the Coming of John" that features two boys named John, one black from a poor family, the other white from a wealthy family. As the two are away at college each family waits 'of the coming of John,' the title is also a reference to maturity and racial identity development because black John becomes disillusioned with race relations as he is awakened to the injustices that seemed so normal. Du Bois writes "he first noticed now the oppression that had not seemed oppression before, differences that erstwhile seemed natural, restraints and slights that in his boyhood days had gone unnoticed or been greeted with a laugh" (p. 144). Though away at college, black John had always intended to return home and when the opportunity came he was a new man. Upon his return, he sought permission from the local Judge, white John's father, to open a school to teach black youth. He was granted authorization as he was forced to agree that he would "teach the darkies to be faithful servants and laborers,"

which he accepted but subversively taught a liberative pedagogy. A month later he was exposed, and his school immediately terminated.

While there is not direct alignment, I believe there are many similarities between the story of the black John and myself. We both had a slow start academically, and though I am intentional about my desire to return to my hometown after graduation there is still the complexity of being deemed different and welcomed with some hostility because of my educational pursuits. Then there's my desire to be an educator that illuminates historic and contemporary racism despite encouragements to ignore race and simply talk about the merits of engineering. Like black John, I too went to college far away from my hometown, developed a heightened awareness of society's racism, and retained a desire to return home to teach youth in my community. And like black John, I want to implement a pedagogy that promotes equity amid inequitable conditions. Perhaps my efforts will not be explicitly shut down like black John's, but certainly I anticipate the bewilderment and disdain he encountered as I attempt to disrupt the robust and normalized affliction of racism.

Since I possess bachelor's and master's degrees in engineering, I am especially looked to as a promoter of science, technology, engineering, and mathematics (STEM) careers to black youth as many of their communities abound with programs focused on developing future STEM professionals. Yet, I am not encouraged to acknowledge the abysmal enrollment rates of blacks in collegiate STEM programs, nor the difficulties they experience while pursuing their degrees and once in the workforce. Black youth across the country are increasingly performing well in a flawed educational system and are not naturally aversive toward STEM. There must be something more than lack of interest and/or preparation contributing to such low enrollment rates. The connection I see here is that the adversity I, and many others, had to overcome is not

present in the public and scholarly discourse (regarding K-12 engineering education), and certainly no one that I have seen/read is explicitly training students to navigate those barriers in addition to STEM content. I aspire to bridge the gap between STEM content and the lived experiences of black males.

# CHAPTER 1: SEARCHING FOR SOMEBODINESS

*"Number one in your life's blueprint, should be a deep belief in your own dignity, your worth and your own somebodiness. Don't allow anybody to make you feel that you're nobody. Always feel that you count. Always feel that you have worth, and always feel that your life has ultimate significance."*

- Rev. Dr. Martin Luther King, Jr. in "What Is Your Life's Blueprint?" (Delivered in front of a group of students at Barratt Junior High School in Philadelphia on October 26, 1967)

## Broadening Participation in Engineering

For decades, reports calling for actions to increase the number of "traditionally" underrepresented racial/ethnic minorities (Blacks[2]/African Americans, Indigenous/Aboriginal peoples, Hawaiians/Pacific Islanders and Latin@s) in science and engineering careers have been produced, withal, this remains a problem the engineering community has yet to significantly disburden (CEOSE, 2015; NAS, NAE, IM, 2011). These reports stem from the "crisis" of a deficient science, technology, engineering, and mathematics (STEM) workforce, prompting pronouncements for our nation to boost attention and resources focused on amplifying the quality and quantity of STEM professionals to retain global scientific and technological competitiveness (Task Force, 1989; STEM Ed. Coalition, 2017). As a result, a movement to broaden participation in engineering (BPE) emerged spurring engineering educators, institutions, and organizations to create policy initiatives and K-12 programs establishing a "pipeline" for youth to develop interest in engineering and receive the proper academic training to pursue a career in engineering. While some progress has been achieved, racial/ethnic minorities remain alarmingly underrepresented in engineering education and employment (NCSES, 2017).

[2] The term 'black' throughout this project, when referring to persons, is used to identify descendants of enslaved Africans brought to America via the Trans-Atlantic slave trade.

Conspicuously absent from these reports and the BPE movement is discussion of the historic exclusion of racial/ethnic minorities in engineering fields, and higher education in general, that stimulated continuous underrepresentation (Slaton, 2010). While stakeholders within and beyond engineering promoting BPE have identified a critical issue in the lack of non-white people in engineering, ignoring the oppression of these racial minorities has made their recruitment and matriculation in engineering education a barren effort (Riley, 2003). Perhaps, part of the failure to achieve parity in representation of people of color in engineering is related to the impetus of action for BPE. Racial/ethnic diversity is seen as a byproduct of changing demographics in a competition for international innovation (Basile & Lopez, 2015; Hrabowski III, 2012; NAE & NRC, 2009), rather than a judicious consequence of equal opportunity in a democratic republic. Major reports that characterize racial/ethnic diversity as an asset to engineering fail to specify in what ways the identity and/or culture of these students will be beneficial to the field besides altering statistics marking their presence (Bayer Corporation, 2012; CEOSE, 2015). Moreover, the authors of these reports tend to present analyses that essentially blame people of color for their non-admission and failure in engineering, citing being academically underprepared, lacking financial resources, and difficulty with social integration (Hurtado et al., 2010; Schmidt, 2008; Strayhorn et al., 2013). A review of available data may validate these conclusions, but multidisciplinary comprehensive analyses need to be considered to authentically illustrate how these circumstances came to exist.

Having "successfully" navigated the educational system as a black male studying engineering, I'd be exploring what insights from my experience are useful to expand the conversation around low representation beyond anti-deficit narratives, or problems with the student's resources and/or experience and begin examining the larger system in which the

student exists. Reflecting on questions like “What helped me? What do I wish I had? What obstacles were overcome? And what failures were experienced?” can help me shape my own instruction. Moreover, my conceptualization of the relevance of engineering considers the legitimacy of arguments for engineering as a pathway for social mobility and doing good in society. Without considering racism, claims can (and have been) be put forth suggesting improved social conditions and social impact for black males. But is it true, and how does the potential financial benefits sit in relation to whites, is the wealth gap closing or would I just be better off than the other poor black people? What is the cost to us in pursuing engineering degrees (financial, emotional, etc.) and perceived advantages? What is the potential benefit to our communities? Such issues place the proposed prestige of engineering under scrutiny and are concrete measures of the present impact of racism.

Though systemic oppression is not included in the *Grand Challenges for Engineering*, as a member of the engineering community, I consider the agony many non-white Americans experience in their everyday lives as citizens, a grand dilemma for expansion of the profession. Growing interests in the inclusion of previously excluded populations should be celebrated, though its realization requires more nuanced understandings of racial/ethnic minorities and their lived experiences. For this reason, this study focuses on my experience studying engineering and how that along with my sociological understanding of other black males influences the why I teach engineering to black males. This project has two objectives, which are to: (a) utilize autoethnography to report my design and implementation of an engineering course that is sensitive to the lived experiences of black males, and (b) offer insights from this course to other engineering educators on how to better educate black boys. The remainder of this chapter provides an abbreviated chronicle of events that are crucial to understanding the shortcomings of

past efforts to diversify engineering and will conclude with the details framing the proposed research.

## Context Matters

Rev. Dr. Martin Luther King, Jr. on October 26, 1967, six months before his assassination, spoke to a group of middle school students encouraging them to figure what he called, their "life's blueprint." The first part of one's life blueprint, King stated, is maintaining a belief in one's "somebodiness," which can be understood as self-worth and self-love (White & Cones, 1999). Just as an architect draws a blueprint to guide construction of a building, Rev. King urged these youths to bolster their sense of somebodiness by identifying their skills and passion(s), then devise a plan to pursue excellence in whatever profession they select. His impartment is relevant for many black youths today who exist in a society that treats them like nobodies. Numerous murders by law enforcement officers (Hill, 2016; Lowery, 2016), post-disaster negligence (Levitt & Whitaker, 2009), compromised water resources (Clark, 2018), the ongoing prison-industrial complex (Alexander, 2012), and mass urban school closures (Kozol, 1991) imply to black citizens (who have been most disproportionately impaired by these circumstances) that their lives are expendable. Rev. King's words are no less true, but spoken today may be perplexing, as many black youngsters are struggling to ascertain their sense of somebodiness amidst an abundance of daily experiences that undermine their dignity and worth.

Black history, meaning American history concerning the experiences of black people, has been a tense relationship between struggle and triumph. Blacks, and all people of color, endured deplorable circumstances to persist toward recognition of their humanity and dreams of material prosperity. A detailed analysis of the event known as the "middle passage," where Africans were shipped across the Atlantic to be enslaved as chattel, is necessary to adequately grasp how a

system of privilege and inequality was initiated through this heinous period of history. Such an account will not be performed in this study, yet some discussion of this tragic event is essential to consider the undiminished benefits of enslavement that drove the evolution and modernization of the United States (Baptist, 2014). The actual number of Africans killed during this time of history can only be estimated but exceeds millions, the loss of dignity and even identity for many is again immeasurable, amount of families fractured multitudinous, and the list of other atrocities is extensive. Even when legalized enslavement ended, the institutionalized oppression of blacks continued.

American chattel slavery was gruesome, but it was only the beginning of economic captivity for blacks. In the foreword for DeGruy's (2015) book, Randall Robinson exclaims, "American slavery was the economic cornerstone on which American wealth and power were built—wealth and power which lasts to this day, as do psychosocial consequences of American slavery, both for the descendants of the enslaved as well as the descendants of the enslavers" (p. ix). This claim is supported by the ability of whites to enact black codes, sharecropping practices, the convict lease system, and other exclusionary actions that further cemented the social standing of blacks in relation to whites (DeGruy, 2005). Being aware of these unjust occurrences does not fully capture the traumatic effects on the blacks that suffered through them, nor the generational trauma and setbacks originated. These circumstances alone were excessive, but history tells they were only precursors to legalized segregation.

The Jim Crow era revealed a trend that continues to stifle the uplifting of the black community. The extraordinary adaptability of racism has perpetuated a "process through which white privilege is maintained, though the rules and rhetoric change" (Alexander, 2010, p. 21). When examining American history, one notices that when traditional methods of racism are

disputed and eventually overturned, new methods of racism emerge that are stronger in rhetoric and support than its predecessor (Alexander, 2010; Tatum, 2003). The cost of such a cycle has been tremendously damaging to the black community, particularly in urban settings. Racialized messaging and corrupt housing practices essentially created urban 'ghettos' (Rothstein, 2017), which in turn became hotbeds for massive unemployment, violent activity, and a host of other affairs that are seldom present in predominantly white middle-class neighborhoods.

## The Immortality of American Racism

Rooted in the happenings of the Trans-Atlantic slave trade, racism, though admittedly more covert, is still prevalent and is much broader than a "willful act of aggression against a person based on their skin color and other phenotypic characteristics" (Parker & Lynn, 2002, p. 8). Indeed, scholars have called for a structural understanding of racism—rather than as an attitudinal affliction that can be eradicated with time—in order to accurately identify and address this intrinsic racial hegemony within American culture (Bonilla-Silva, 2014; Feagin, 2000; Omi & Winant, 1994). Yet, proclamations of colorblindness and post-racial conditions, particularly during the two-term presidency of Barack Obama, dominate the public discourse on race relations in this nation. While many black Americans have attained various forms of success, more widespread are the implications of a racialized society that benefits those deemed as white over those considered non-white (Bell, 2008; DeGruy, 2005; Franklin, 1993; Tatum, 2003).

This deliberation of the burden of racism and its adverse repercussions requires defining race and racism. Race is understood as the "socially constructed meaning attached to a variety of physical attributes including but not limited to skin and eye color, hair texture, and bone structures of people in the United States and elsewhere" (Singleton & Linton, 2006, p. 39). This definition emphasizes the fact that race is a social construction, which is how the boundaries of

classifying people as one way or another has occasionally changed in American history. Nevertheless, racial classifications have ideological and material dis/advantages in our society. Thus, racism is taken to connote "the conscious or unconscious, intentional or unintentional enactment of racial power, grounded in racial prejudice, by an individual or group against another individual or group perceived to have lower racial status" (Singleton & Linton, 2006, p. 40). The effects of racism are indifferent to the intentions of the perpetrator, and incorporate power dynamics, which is why a proper understanding of this concept is vital. Likewise, *institutionalized* racism occurs when "organizations—such as a school or a school district—remain unconscious of issues related to race or more actively perpetuate and enforce a dominant racial perspective or belief" (Singleton & Linton, 2006, p. 41). When institutionalized racism is active, individuals within the institution need not be "racists" for racial inequities to persist; instead, their ignorance, silence, or inaction allows the racialized power structure to become normalized.

After more than three centuries of state-sponsored terrorism and apartheid against black people, no recompense has ever been given. In the absence of financial and psychological rehabilitation, it is no surprise that a recent report found black men (and in some cases black women) at or near the bottom in comparison to other races/ethnicities across 10 key measures of social well-being (i.e., employment, poverty, safety net use, housing, education, incarceration, health, earnings, wealth, and mobility) (Stanford Center, 2017). The report states black men have had the lowest rate of employment among all men for every month dating back to 1940, and the reasons for this epidemic presented in other literature include "racial discrimination, arrest records, and, for older men, weaker educational credentials" (Hout, 2017, p. 5). The academic achievement gap between blacks and whites has decreased over the last 15 years in early

elementary and pre-school but is roughly the same for fourth and eighth graders, where black students are about two-and-a-half grade levels behind white students (Reardon & Fahle, 2017). According to Reardon and Fahle, which is quite devastating, "nonschooling factors—persistent racial and ethnic disparities in family resources and segregation patterns—are fundamental determinants of unequal educational opportunity for minority students" (Reardon & Fahle, 2017, p. 20). This is *systemic* racism, where a combination of factors across institutions work together to disenfranchise one or more persons belonging to a racial group. It is evident from this report that systemic racism is ensuring destituteness for non-white citizens, especially black men, but its authors profess this national pandemic can be powerfully condensed if our country committed to eliminating discriminatory practices across various sectors and enforcing fair initiatives for all youth.

The magnitude of systemic racism has created a condition where the odds are in favor of failure for black males (Hrabowski III, Maton, & Greif, 1998), their success in one area can be overshadowed by existential setbacks in another. Racial disparities in housing are perhaps the most significant (Desmond, 2017; Moskowitz, 2017), as many sectors where inequalities exist not only work together but are interrelated. For example, segregated communities have direct correlations with communal wealth, rates of crime, standard of public schooling, and many other factors that shape one's quality of life and lifespan. Nikole Hannah-Jones, an esteemed journalist, describes the proverbial box that constrains black children:

> Segregation in housing is the way you can accomplish segregation in every aspect of life. Housing segregation means that certain jobs are located in certain communities, that certain grocery stores are located in certain communities; it determines where parks are located, if streets are repaired, if toxic dump sites are built nearby. Segregation accomplishes so many other inequalities because you can effectively contain a population to a geographic area and suddenly all the other civil rights laws [sic] don't matter. (Illing, 2017)

This commentary infers intentionality in the configuration of our society's ghettos and the overwhelming burdens faced by their inhabitants, within this lexicon the dangers of systemic racism become apparent. The abiding ramifications of racism condemn the conscience of our nation, and the immeasurable trauma of intergenerational racism is a stark discrepancy between the Constitution and the lineage of enslaved Africans; on the other hand, the mere avoidance of extermination is a testament to the fortitude and vitality of black Americans.

I believe there is great benefit to prolonged engagement in a community one serves (and studies); in fact, I advocate positioning oneself in that community beyond one's direct service (i.e. living there). In this way the realities and manifestations of racism are not only perceived but experienced, providing an opportunity to learn and teach material that connects to the daily lives of one's students. K-12 engineering education lacks public and scholarly discussion of this, despite a growing trend of activities and curricula that aim to be culturally relevant. When a researcher is situated in a community context, what opportunities arise to connect research to practice and what are the disconnects? What are the everyday realities that do not fit nicely into publications and research outcomes? What are the indirect or unintentional learning experiences for both the scholar(s) and the community? What is the additional, yet essential, work beyond the intended purpose (e.g. behavioral management)? What I've learned from my experience and review of literature is academic success is insufficient for black male liberation; moreover, social responsibility must be integrated into any educational development. This entire project is an argument for teaching with our racialized societal context in mind as well as the particular community context where one practices.

## Involuntary Resistance and Complicated Resistance

Black men have contributed tremendously to the rise and formation of America as a wealthy and prominent nation; still our humanity is regularly disregarded and rejected, regardless of educational attainment or socioeconomic status. This transcendent prejudice leads to exasperation, causing some black males to excel for the sake of disproving false beliefs while others descend into a cycle of deprivation and generational demise. The living black male is the result of involuntary resilience. The plight of the black male today is mostly borne out of an antagonizing public-school educational experience, which began long ago (Shujaa, 1994). Madhubuti (1990) speaks for many black males, though not all, when he writes "the major piece of information I absorbed after twelve years of public education was that I was a problem, inferior, ineducable and a victim. And, as a victim, I began to see the world through the eyes of a victim" (p. ii). This sentiment conveys the search for somebodiness navigated by many black males today. Despite great achievements by black male inventors, entrepreneurs, and scholars, black men are more often publicized as thugs and ruthless criminals lacking any regard for educational endeavors. Nonetheless, black men are learning, they understand that society loves to watch them on the athletic terrain or in the entertainment industry and is willing to provide economic prosperity for their physical sacrifice and creative amusement.

Financial success in sports and entertainment has allowed for a blind eye to the realities present for black men in America. Harrison (1998) points out this veil of distraction, "the media's constant flashing of salaries next to a black male athlete's face has negated issues to the public in terms of exploitation and contemporary colonization" (p. 46). This statement presents the dilemma of consciousness facing the black male today. Many men desire dignity and a feeling of success, *and* they desire the financial status, which will allow them to be breadwinners

for their family; in addition to being leaders within the household and communal context. Unfortunately, "they are not convinced that they will get good jobs even if they go to college" (Bryant, Jr., 2000, p. 13). Cross & Slater (2000) echo this point, communicating the distrust many black males have for the educational system, "young black males will persist in seeking higher education only so long as they are persuaded that the educational effort is worthwhile and that serious job opportunities lie ahead" (p. 87). Since the guarantee of quality jobs is absent, black men choose instead to demonstrate their physical and intellectual prowess on the football field, basketball court, or performance stage[3].

Intelligence is not comprehensively determined by one's schooling experience; research has continually shown the flaws in the overused standardized testing present in today's school system (French, 2003; Haladyna, Haas, & Allison, 1995; Lomax et al., 1995). Additionally, many scholars have presented cases addressing the over-penalization of black youth in schools and the tendency of teachers and administrators to focus more on the behavior of rather than the academic performance of black males (Ferguson, 2001). When scholarly pursuits seem unfruitful and without acclaim and recognition, "the African American male makes a conscious decision to market his athletic, entertainment, or brokerage skills to the highest employer" (Bryant, Jr., 2000, p. 14). Notwithstanding, creative genius is still present in these non-academic endeavors; in fact, such ingenuity is the outcome of resilience at its greatest level. The problem is that the arenas where many black males choose to exhibit their grand feats of intelligence are insufficient for their holistic individual well-being, and the health of the greater black

[3] I acknowledge that employment data shows there are more black males in professions other than athletics and entertainment; however, these statistics do not account for black men that chose different careers or stopped seeking employment after athletic or entertainment dreams were deferred.

community. Herein lies the defining struggle of the black male, his fight (or lack thereof) to control his own mind. The ethos of the contemporary black male is both a product of and a protest to racism in America.

## Teaching the Disinherited

The research problem addressed in this study relates to the absence of sociopolitical teaching practices in K-12 engineering education, which is necessary for equitable inclusion of underrepresented racial/ethnic minorities. Specifically, black Americans are plagued by racial inequities that transcend all domains of societal living (e.g., economics, education, health, etc.); this lamentable reality is the direct result of historical disenfranchisement of this racial group within the United States. Therefore, engineering must be taught with pertinence to the social, political, and cultural realities of the pupils. Barton (2001), when discussing aspirations for broadening participation in science, argues "unless it emerges from praxis and is centrally about a political commitment to the struggle for liberation and in defense of human rights, [it] will fall short of helping us to make sense of the goal of scientific literacy for all" (p. 899). The same is true for K-12 engineering education stakeholders seeking to fully engage all pre-college youth.

This dissertation is an investigation into my story of living as a black male and studying engineering, and how my experience (along with my sociological understanding of other black males) shapes the way I teach engineering to black boys. Critical autoethnography was used to articulate the cultural and experiential knowledge that guided my instructional methods. Black Critical Theory, an offshoot of Critical Race Theory, serves as a theoretical framework for this study because it centralizes the prevalence of American racism as a lens to understand the experiences of black citizens. African American Male Theory is a complementary framework to Black Critical Theory as it takes a broader ecological perspective to analyze the experiences of

black male citizens. Taken together, these frameworks reveal the distinct features of American life negotiated by black males to reduce ignorance and prompt fair-minded action.

The research questions that guided this study are:

1. How does being a black male engineering educator offer insights about teaching engineering to black boys?
    - How do I conceptualize engineering and its value for black boys?
    - How do I attempt to address the gaps between black culture and engineering culture (i.e., its pedagogy and practice)?
2. In what ways does being a black male community-engaged scholar inform the way I teach engineering?
    - What strategies and activities did I develop and implement to assist black boys' practice using engineering design and engineering thinking to address structural inequalities (i.e., racial prejudice, inadequate school resources and training)?
    - What value (e.g., as educator, for community) is added through regular extracurricular activities (e.g., volunteerism, church) in the community of the students?

In answering these questions, my desire is to enrich the work of pre-college engineering educators by demonstrating the benefits of implementing a race-conscious pedagogy.

The significance of this project is its potential to enculturate engineering educators with a population that is heavily studied and still largely misunderstood. According to Howard (2001), "research indicates that effective teachers of African American students are not exclusively concerned about students' academic and cognitive development but about their social, emotional, and moral growth as well" (p. 186). Engineering has its own culture, and as engineering educators, we must consider how the cultural background of students fuse (or separate) with the epistemological and ontological formation of an engineer. The prevailing emphasis on the scientific and mathematical, problem-solving, and making dimensions of engineering may cause a student to believe society lacks complexity and operates in a mode of predictable behavior, but the social world is not homogeneous, and innovation implies appreciating the different aspects of social reality (Pawley, 2009; Bovy & Vinck, 2003).

It is not necessary for the teacher to be of the same culture as the students, but some cultural bridging must take place (Gutstein et. al, 1997). Cultural connections should be established through using subject matter to explore problems of interest to the students, building on the knowledge and expertise students bring to the classroom (Tate, 1995). Overcoming the difficulties for young black learners begins with educators possessing a positive attitude regarding the intellectual potential of their black students, along with a willingness to establish a supportive and edifying educational experience. “Indeed, the literature suggests that teachers who bridge the gap between home and school and are sensitive to and knowledgeable of their students’ cultural and community heritages, who maximize learning time, who believe that all students can learn, and who provide engaging cooperative learning experiences promote resilience and foster success among these youth” (Floyd, 1996, p. 182-183). Essentially, improving the educational experience for black youth means reforming the role of the teacher. Educators should design not only activities, but also experiences and environments that clearly communicate to students that the purpose of their learning is to assist their formation into productive citizens of society.

# CHAPTER 2: REVIEW OF RELEVANT DISCOURSES

## Guilty Until Proven Innocent

In this chapter, I offer a review of relevant public and scholarly discourses related to the underlying concepts that blend to form the impetus for this inquiry. The Curriculum on Repurposing Engineering And Teaching Equity (CREATE) curriculum, in conjunction with acritical autoethnography research methodology were strategically chosen as an attempt to facilitate and investigate an anti-racist K-12 engineering education course for black boys. To inform my intentions on teaching engineering to black boys, I synthesize literature on the ways black boys are treated in pre-college educational settings. Naturally, I then examine discussions on the meaning of engineering and how it should be taught at the K-12 level. Thirdly, articles concerning the larger context of preparing youth to be engaged and socially responsible citizens are explored. The remaining sections of the chapter will detail literature related to the theoretical frameworks for the research methods selected for this investigation.

Recently, a study conducted by the Yale Child Study Center revealed what can be seen as nocuous biases held by pre-school teachers and staff. Researchers found that teachers (black or white) tend to focus more attention on black boys when misbehavior is expected; moreover, black teachers judge misbehavior by black students more harshly and are more likely to recommend suspension or expulsion for these pre-K students (Gilliam et al., 2016). Referred to as the "push out" phenomenon, high rates of pre-school expulsions and suspensions are alienating black boys and setting them (and those around them) on a pathway to accepting and even expecting their failure. Ferguson (2001) recounts one of her site visits during her study of black boys in public schools and tells of her bewilderment when she recognized "no one at the

school seemed surprised that the vast majority of children defined as "at-risk" of failing academically, of being future school dropouts, were mostly black and male" (p. 4). Watching black boys underperform and eventually dropout of school has become commonplace. Criminalizing black boys in school is ordinary. Perhaps then, it becomes comprehensible why black boys begin to disengage academically and look for other mediums of validation in the fourth-grade (Ferguson, 2001; Kunjufu, 1983).

The poor academic performance of black male students in traditional learning environments has been long researched and documented; unfortunately, few, if any, modifications have been made in the way they are educated (Floyd, 1996; Kirkland, 2008; Nasir & Hand, 2008). One explanation for the scholastic decline of many black male students is the disconnection between their cultural expression (e.g., ways of speaking, ways of dressing, etc.) and conventional classroom cultural norms that place them in a low achievement trap during their early schooling, and continues throughout their academic career (Hale, 1981; Ladson-Billings, 1994). The increased academic demands during middle school years can be difficult for any child but are particularly critical for black boys that may already be behind in academic ability and facing non-academic disadvantages (ETS, 2012). Black male students are often viewed as incapable or underperforming in traditional classroom settings, lacking the skills and/or motivation necessary to succeed (Kirkland, 2008). This belief is profusely implied by the surplus of literature documenting black males' underachievement; contrarily, black boys do not enter the school system lethargically, but are psychologically pulverized by relentless maltreatment and low expectations thrust upon them (Brown, 2011; Harper & Davis, 2012; Howard, 2008, 2014; Howard & Flennaugh, 2010; Howard, Flennaugh, & Terry, 2012; Noguera, 2005).

In the midst of this dispirited state of schooling for black boys there is good news, as numerous educational researchers have committed their careers to highlighting pedagogical practices and other factors that contribute to the academic success of black boys. Fundamental to black male scholastic achievement is a teacher that is concerned with the entirety of their personhood (Harper & Wood, 2015; Irvine, 1990; Murrell, 2002). Ladson-Billings (1994) suggests teachers of this sort are concerned with three specific aspects of the educational experience: a strong focus on student learning, developing cultural competence, and cultivating a sociopolitical awareness in students. Scholars declare teachers must do more than simply acknowledge the cultural differences present in their classroom, they must consider the inclusion (or lack thereof) of the cultural viewpoint of their students in curriculum materials (i.e. textbooks, videos, field trips), societal prejudices experienced by their students outside of school, and even examine their own potential cultural biases (Brown-Jeffy & Cooper, 2011; Gay, 2002; Howard, 2003; Ladson-Billings, 2014; Milner IV, 2011; Osborne, 1996). The messaging black boys receive is also crucial to their success, Carter Andrews (2015) points out, "messages that black parents convey to their sons about the significance of race and racism in their educational and life trajectories can serve to counteract experiences with racism, influence academic motivation, and lead to better academic performance" (p. 54). Though referring to parental relationships, educators can also affirm and/or instill healthy, honest conceptualizations of racial identity in black boys.

## K-12 Engineering Education: Hands-on, Minds-on

Science, Technology, Engineering, and Mathematics (STEM) capacity and its proliferation have been at the forefront of American culture since the 1950s, a time in history oft referred to as *The Sputnik Era*. The Soviet Union's successful launch of the world's first artificial satellite

simultaneously motivated American governmental leadership to invest greatly in STEM innovation, which directly led to the establishment of the National Aeronautics and Space Administration (NASA) (Marick Group, 2016; NASA, 2007). Interestingly, however, the acronym STEM in its current form did not exist until 2001 when Judith A. Ramaley, a former director of the Education and Human Resources Division at the National Science Foundation (NSF), rearranged the letters of the abbreviation formerly known as SMET. This event is noteworthy as it signified a burgeoning agenda within the NSF to advocate for all pre-college students to be exposed to STEM education (Sneider & Purzer, 2014). Presumably, the premise of this shift was that the nation's ability to sustain STEM innovation depended upon a broad pool of potential STEM professionals, which meant all students needed some engagement with STEM subjects.

Over time, expanded support of STEM educational initiatives continues to grow, which includes a governmental Act (America COMPETES Act), still some scholars have recently begun pushing for greater inclusion of the 'E' in STEM (Miaoulis, 2014; Moore et al., 2014). This means engineering curricula and assessment standards designed for widespread exposure to all students through public and private schooling experiences. There is a great breadth of areas of specialty within the field of engineering, and an even greater expanse of conceptualizations for the meaning of engineering. Engineering education is also a reasonable method for increasing students' understanding of other subject matter "given the need for engineering design solutions to use mathematical and scientific ideas" (Moore, 2014, p. 40). The interdisciplinarity of engineering and its relevance beyond its native context has led some scholars to urgently promote a more explicit and dynamic presence of engineering in pre-college settings (Ganesh &

Schnittka, 2014). The knowledge many stakeholders are working to spread can be summarized as engineering literacy, which Purzer, Strobel, and Cardella (2014) describes as:

> the ability to solve problems and accomplish goals by applying the engineering design process – a systematic and often iterative approach to designing objects, processes, and systems to meet human needs and accomplish goals. Students who are able to apply the engineering design process to new situations know how to define a solvable problem, to generate and test potential solutions, and to modify the design by making tradeoffs among multiple considerations in order to reach an optimal solution. Engineering literacy also involves understanding the mutually supportive relationship between science and engineering, and the ways in which engineers respond to the interests and needs of society and in turn affect society and the environment by bringing about technological change (adapted from NAGB, 2010). (p. 8-9)

Engineering literacy is an integral component in the pathway for pre-college youth interested in pursuing engineering careers.

The work of engineering educators in the K-12 realm is powerful because the perceptions youth develop of engineering, or any profession and subject matter, can attract or deter their attention. While there is a tremendous demand for more engineers, educators must demonstrate some caution in how the essence of engineering and its impact on society is communicated. With that in mind, the definition of engineering utilized in this project is a broad notion on what engineering *should* be, I realize there have been many shortcomings in the education and practice of engineers to actualizing this view of the field. According to Figueiredo (2008), engineering comprises of four dimensions: the basic sciences, social sciences, design, and practical realization (Fig. 1). While I do not completely agree with the definitions of each of Figueiredo's dimensions, I find his framing of each domain useful in categorizing the multidimensionality of engineering.

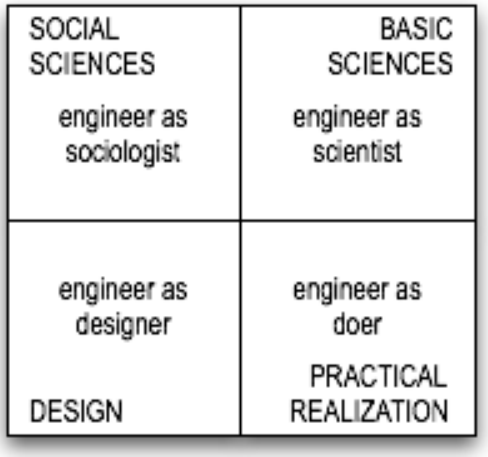


Figure 1: Figueiredo's (2008) four dimensions of engineering

In the dimension of the basic sciences, engineering is viewed as the application of the natural and exact sciences, stresses the values of logic and rigor, and sees knowledge as produced through analysis and experimentation. This perspective provides two weighty claims: that science can be exact and that knowledge results from the scientific method. I contest the epistemic authority of the scientific method embedded in this dimension but understanding and applying the basic sciences is a vital aspect of engineering and is prioritized in the way engineering is taught and promulgated (Hynes & Swenson, 2013; Pawley, 2009). The social sciences dimension sees engineers not just as technologists, but also as social experts, in their ability to recognize the eminently social nature of the world they act upon and the social complexity of the teams they belong to (Figueiredo, 2008). This frame of reference implies engineers can interact with others within society and can accurately determine their needs. There is much evidence on how engineering has been historically deficient in this area (Riley, 2008); however, a growing number of recent scholarship and reports are advocating for an improved effort to develop and demonstrate these social skills (Fila et al., 2014; NAE, 2004).

The design dimension sees engineering as the art of design. The overlap between engineering and design is apparent as Lawson and Dorst (2009) speak of design as a problem-solving process, which Koen (2003) describes as the engineering method. These perspectives will be explored later in this chapter when discussing the engineering design process and its influence on K-12 engineering education. Practical realization, the final dimension, views engineering as the art of getting things done, valuing the ability to change the world and overcoming complexity with flexibility and perseverance. It is in this dimension that the engineer has the capacity to affect the well-being of greater society. I suggest the intersection of the four-dimensional framework Figueiredo presents is where emphasis should be, because it produces a holistic engineer capable of responsibly addressing issues in society. The importance of an engineer's ability to get things done should parallel their ability to appropriately access and engage the social nature of the world in which they work. It is my opinion that only when this occurs can we define engineering as improving the living experience for all of society.

**Goals of K-12 Engineering Education**

As discussed earlier, there is currently a significant interest in producing more, qualified engineers. Funding agencies, such as the NSF, are supporting projects and programs aimed at addressing these national concerns. Strobel et al. (2012) conducted a study to evaluate the approaches and goals of projects funded by the Advanced Technological Education Program (ATE), which is supported by the NSF. This research provided much insight into the types of learning practices being implemented and the objectives of the programs; however, there is not any data/information on these programs' ability to satisfy their objectives. The top three learning objectives were to improve the awareness and understanding of STEM careers, attract students to

STEM careers, and formulate basic technical knowledge respectively. These motives seem aligned with the national focus to increase/extend the engineering pipeline.

According to Brophy et al. (2008), design-based activities can develop deep conceptual understanding of the knowledge and principles of a domain and support the development of self-guided inquiry skills (p. 372). Educators involved with K-12 engineering education informal learning follow the five categories of competencies essential to engineering design proposed by Hannan et al. (1997). These competencies are information gathering, problem definition, idea generation, evaluation and decision-making, and implementation. Furthermore, integrated in each of these competencies are efforts to cultivate teamwork and communication skills. Since design is a hands-on and experiential activity, it allows students to develop confidence and formulate a conception of themselves as engineers. Moore et al. (2013) have developed a framework which they believe can serve as a guideline for quality implementation of engineering education at the K-12 level, suggesting, "the framework is designed to be used as a tool for evaluating the degree to which academic standards, curricula, and teaching practices address the important components of a quality K-12 engineering education" ( p. 3).

It is important to note that while many programs have been started to engage students in engineering outside the formal classroom, some states have also added engineering to their classroom standards. Therefore, many frameworks, principles, and standards are being organized with both informal and formal learning settings in mind. This allows for the rigor of the formal classroom to be extended to informal learning spaces. Similarly, the idea of STEM integration has become a focus of pre-college engineering education. STEM integration prevents Engineering from being taught in isolation, instead integrating concepts from Science, Math and Technology to develop students' competencies in each subject area.

A fundamental understanding of science and mathematics is crucial for participation in engineering; therefore, program organizers include content from one or both disciplines in their activities. The Wireless Integrated MicroSystems (WIMS) summer pre-college program exposed students to courses they may experience during their college career, including pre-algebra, algebra, introduction to C++ programming, computer aided drafting using Unigraphics, and others. Other programs use robotics competitions to develop participants' science and mathematical skills; for example, a *Robofest* 2013 game required students to compute the area of a circle based on measurements of the amount of rotations of the wheels to follow the circumference of a circle. These encounters expose students to the practice of applying their learned math and science knowledge to problems presented to them.

**Engineering Design Process & Engineering Thinking**

The engineering design process (EDP) is frequently cited as a primary component of engineering learning (NAE & NRC, 2009; Purzer, Strobel, & Cardella, 2014), although there is not a singular representation of the EDP that has been determined the standard for educational purposes. Instead, the importance of understanding a systematic approach to problem-solving has been indicated as a salient objective for any instruction using the EDP (Hynes, 2012). Design in engineering can be defined as "the approach engineers use to solve engineering problems—generally, to determine the best way to make a device or process that serves a particular purpose" (NAE & NRC, 2009, p. 38). The International Technology and Engineering Education Association (ITEEA) offers a definition that is more specific, describing the design process as "a systematic problem-solving strategy, with criteria and constraints, used to develop many possible solutions to a problem or to satisfy human needs and wants and winnow (narrow) down the possible solutions to one final choice" (ITEEA, 2016). In this way, design is employed with less

of an artistic connotation and more so as a strategy to produce some solution to an identified problem. There are certain characteristics that specify the use of design in engineering, which include being purposeful, considering specifications and constraints, and being socially engaged and collaborative (ITEEA, 2000). Engineers design with the desire to satisfy some specified criteria and work within the boundaries of limitations (e.g., time to complete project, costs, etc.) of their project. Additionally, they are encouraged to interact with the potential end-user(s) of their design and often work with colleagues in teams or other professionals across domains of specialty (Cunningham & Lachapelle, 2014).

An outlined procedure of steps is what makes engineering design into a process that can be taught and practiced with young learners. Though this procedure is not linear and can involve many iterations, there are some basic components that form the structure of the EDP. Engineers first identify a problem, then move to generating ideas for solving the problem, next they construct test models, which is followed by evaluating the efficacy of their solution (NAE & NRC, 2009). The ITEEA has the most detailed EDP model, displayed as Figure 2 with explanations for each step, while other models combine or generalize steps. Although there are many other versions available, ITEEA model is the only one presented here because of its comprehensiveness.

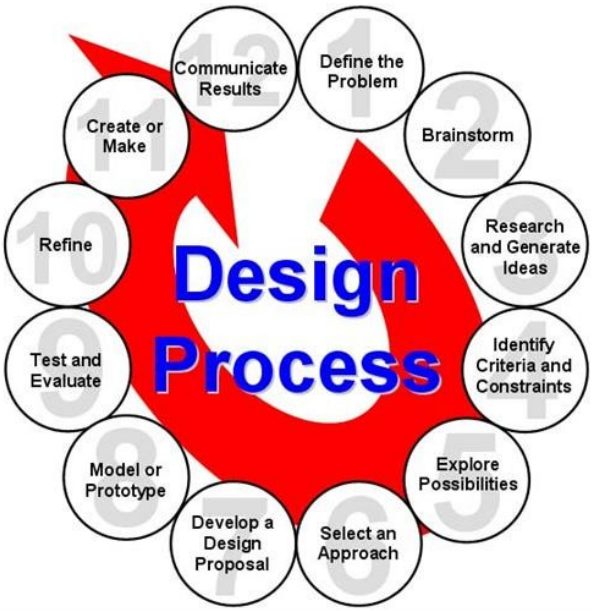


Figure 2: ITEEA Engineering Design Process

1. *Define a Problem*

a. Receive a problem to solve from the client.

b. Gather information.

c. Be inspired through media exposure of a current problem and act.

2. *Brainstorm*

a. Present ideas in an open forum.

b. Generate and record ideas.

c. Keep the mind alert through rapidly paced sessions.

d. Develop preliminary ideas.

3. *Research and Generate Ideas*

a. Conduct interviews with those affected by the problem.

b. Research solutions that may already exist; identify reasons why they aren't appropriate.

c. Compile ideas and report findings to the team.

4. *Identify Criteria and Specify Constraints*

a. Identify what the solution should do and the degree to which the solution will be pursued.
b. Identify constraints (i.e., budget and time are typical considerations).
c. Draft the Design Brief.

*5. Explore Possibilities*

a. Consider further development of brainstorming ideas with constraints and tradeoffs.
b. Explore alternative ideas based on further knowledge and technologies.

*6. Select an Approach*

a. Review brainstormed information and answer any lingering questions.
b. Narrow ideas down through a voting process, or by use of a decision matrix.
c. Decide on final idea, usually through group consensus.

*7. Develop a Design Proposal*

a. Explore the idea in greater detail with annotated sketches.
b. Make critical decisions such as material types and manufacturing methods.
c. Generate through computer models detailed sketches to further refine the idea.
d. Produce working drawings so the idea can be built.

*8. Make a Model or Prototype*

a. Make models to help communicate the idea, and study aspects such as shape, form, fit.
b. Construct a prototype from the working drawings, so the solution can be tested.

*9. Test and Evaluate the Design Using Specifications*

a. Design experiments and test the prototype in controlled and working environments.
b. Gather performance data; analyze and check results against established criteria.
c. Conduct a formal critique to flesh out areas of concerns and establish any need for redesign.

*10. Refine the Design*

a. Make design changes; modify or rebuild the prototype.
b. Make refinements prototype's performance results are consistent.

c. Update documentation to reflect changes.

d. Receive user's critique to determine if established criteria have been met.

*11. Create or Make Solution*

a. Determine custom/mass production.

b. Consider packaging.

*12. Communicate Processes and Results*

a. Communicate the designer's final solution through media (e.g., poster session, report).

b. Market the Product.

c. Distribute.

There is not a universal definition for what specific thinking skills are necessary to be an engineer; thus, a general approach was used for exploring the skills programs focused on to develop engineering thinking. The National Academies of Engineering (NAE) & the National Research Council (NRC) (2009) defined engineering habits of mind as systems thinking, creativity, optimism, collaboration, communication, and attention to ethical considerations. The Engineer of 2020 report listed engineering attributes as possessing strong analytical skills, practical ingenuity, creativity, communication, business and management abilities, leadership qualities, high ethical standards, professionalism, dynamism, agility, resilience, flexibility, and be life-long learners (NAE, 2004). One may question to what degree can these attributes be cultivated at the K-12 level; still many of these outlined characteristics are explicitly and/or implicitly stated in the goals of K-12 engineering education informal learning programs. Hannan et al. (1997) describes an engineering design summer camp that integrated the steps of the design process with a focus on teamwork, communication skills, and process improvement; similarly, Caroll (2014) describes a project where students focused on the development of a prototype

mindset and creative confidence. These skills emphasize helping students become familiar and comfortable with designing and re-designing solutions and using their imagination in their designs. Another program uses the advantages of a studio to foster engineering attributes, explaining, "learners justify their proposals in design critiques, incorporate input from peers and facilitators, and co-construct design ideas" (Schnittka et al., 2012, p. 13). A large aspect of the programs was providing opportunities to actively engage in the exercises; thereby, formulating students' thinking abilities as they participate.

STEM careers, though widely popular, will only be occupied by a segment of the population; therefore, STEM education in K-12 settings needs to be sufficient in serving both students who will pursue STEM degrees/careers and those who will not. In contrast, thinking is necessary for all individuals, especially critical thinking. As domain specific educators, the task becomes elucidating the aspects of one's field that satisfy the paradox of being broad enough that it is relevant to any student, while also specific enough for its content to be measured and assessed. Cuoco (1996) alludes to this point when explaining, "[teaching mathematical habits of mind] does not mean that high school students should be able to understand the *topics* that mathematicians worry about, but it does mean that high school graduates should be accustomed to using real mathematical *methods*" (p. 377-378). Correspondingly, it is useful for students to realize that the engineering habits of mind (eHOM) are transferrable, meaning they can be exercised in any context in one's life. The components of eHOM are systems thinking, creativity, optimism, collaboration, communication, and attention to ethical standards (ITEEA, 2000).

eHOM consists of values, attitudes, and thinking skills that should dictate the problem-solving strategies of engineers, and they align with the fundamental skills sought for citizenry in the 21st century (NAE & NRC, 2009). The concept of habits of mind was originally introduced

by the American Association for the Advancement of Science (1989) but has since been adopted by the field of engineering (ITEEA, 2014). The habits of mind that are classified under "values" are ethics (i.e. attention to ethical standards), collaboration, and communication. These are meaningful elements to engineering in and of themselves but are also channels through which the most important considerations for the engineer(s), the stakeholder(s), or the user(s) can be acknowledged and addressed. Practicing ethics involves scrutinizing the proposed solutions for potential harm that would be caused to people or the environment being affected by the solution, then selecting the solution that completely avoids damaging effects (or minimizes harm if unavoidable). Working in collaboration means exercising teamwork, being able to productively and respectfully interact and labor with other individuals for a unified purpose. Communication is being able to learn and understand the values of all parties involved with the problem (e.g. stakeholders, end-users, etc.) and inform others of one's ideas/solutions to the problem.

The habits of mind classified under "thinking skills" include systems thinking and creativity. There is a vast array of definitions to explain critical thinking, which are practical skills one can possess to exemplify judicial reasoning with appropriate scrutiny. Systems thinking affords an individual the ability to perceive the interconnections between the multiple facets of a specific problem. This may involve predicting the outcomes of interactions between the variables within the system/situation as a result of the solution being contemplated. Creativity employs the engineer's imagination to produce solutions that are abnormal and extraordinary. There is only one habit of mind categorized as an "attitude," and that is optimism. Problem solving is a difficult task and often requires a unique perspective to persist beyond the challenges encountered. Engineers must remain hopeful that there is indeed a viable solution to the problem

to which one is devoting effort to. This may require enacting perseverance or endurance when failure is experienced, or a feeling of despair is burgeoning.

**Teaching Engineering in K-12 Informal Spaces**

For the purposes of this literature review, I defined informal learning programs to be any activities performed outside of the traditional school classroom setting and schedule. This includes outreach (or other) programs that took place after-school, on the weekends, and/or during the summer. The NAE & NRC (2009) suggest informal learning can take place in "a broad array of settings, such as family discussions at home, visits to museums, nature centers, or other designed settings, and everyday activities like gardening, as well as recreational activities like hiking and fishing, and participation in clubs" (p. 14). Features of informal learning environment are usually "the role of media as a context and tool for learning and the opportunities these environments provide for inclusion of culturally, socially, and linguistically diverse communities" (NAE & NRC, 2009, p.15). Informal learning programs allow educators flexibility in structure and content, but also the bureaucracy of the traditional classroom. I intentionally use the term "educator" to describe the wide-variety of participants that serve as instructors within informal learning spaces, including, professional engineers, professional teachers, undergraduate/graduate students, parents, and even high school students. I have chosen to focus on the K-12 realm because much research has demonstrated students' choice of major field of study in college relates to their pre-college experiences (Harwell & Houston, 2012; Phelps, Camburn, & Min, 2018; Sahin, Ekmekci, & Waxman, 2017). While the current push for more pre-college engineering initiatives is exciting, a sufficient amount of scrutiny is necessary to determine the real impact of such initiatives. One should consider whether these programs are successfully providing genuine engineering experiences to students or piquing the interest of

students through new experiences that lack engineering merit. The purpose of this literature review section is to explore the actions of educators in the informal learning space and examine how their instructional effectiveness can be improved by applying an equity lens to their pedagogical practices.

An important aspect of K-12 engineering programs is the educators and mentors involved with the programs, and their ability to provide accurate information and genuine educational experiences for the program participants. In many cases the educators and mentors are strategically chosen to advance the objectives of the program. Anderson et al. (2003) expressed the desire to increase young women's awareness and pursuit of engineering as a career choice, by exposing them to "undergraduate engineering students, instruction by female science and engineering faculty and staff, and panel discussions with female professional engineers." The professors and industry professionals being of the same gender as the young ladies is important because their presence supports the aspirations of the students by demonstrating success in engineering as a woman is possible. The use of college students studying engineering as instructors, assistants, and mentors allows the information to be communicated in a relatable manner; in addition, it provides opportunities for informal conversations where college students can share insight into their reasons for pursuing engineering. Additionally, college students are in-touch with engineering material and can accurately describe the knowledge and understanding necessary to participate in the field of study.

Teaching in informal learning spaces allows for freedom in using innovative and research-proven educational practices. Strobel et al.'s (2012) study showed that one-third of all activities performed to engage students in engineering and/or technology involved either hands-on or project-based learning activities. Furthermore, "an important pedagogical characteristic

contributing to the success of outreach programs is reliance on opportunities for learners to generate ideas and act on them." One after- school program, Studio STEM, is described as an excellent model to emulate as K-12 engineering education seeks to expand. The program used a design-based, environmentally-themed curriculum to introduce middle-school students to engineering. The model implemented research and theories focused on student learning and child development to construct a program that genuinely engages middle-school students in engineering. The design studio facilitates successful problem solving within groups, through the integration of cognitive and social elements, which may not be the norm for collaborative learning. The program organizers considered not only the presentation of engineering-related information, but also students' foundational beliefs and knowledge bases. Youth who are strongly identified with an academic domain are also more likely to have goals, beliefs, and identities that foster their success in these areas (Osborne & Jones, 2011). The students could communicate their understandings at a deeper level, because of the intentional activities that focused on their knowledge development within the program.

**Strands of Informal Engineering Learning**

These are six interweaving strands that describe goals and practices of engineering learning. It is important to note that while these strands reflect conceptualizations developed in research, as a set they have not been systematically applied and analyzed. The strands are interdependent—advances in one are closely associated with advances in the others. Taken together they represent the ideal that all institutions that create and provide informal environments for people to learn science can strive for in their programs and facilities.

Learners who engage with engineering in informal environments (adapted version of the strands presented in Kotys-Schwartz, Besterfield-Sacre, & Shuman (2011);

- Strand 1: Experience excitement, interest, and motivation to learn about engineering and the design process.
- Strand 2: Come to generate, understand, remember, and use concepts, explanations, arguments, models and facts related to engineering.
- Strand 3: Manipulate, test, explore, predict, question, observe, and make sense of engineering in the world.
- Strand 4: Reflect on engineering as a way of knowing; on processes, concepts, and institutions of science; and on their own process of learning about phenomena.
- Strand 5: Participate in engineering activities and learning practices with others, using engineering language and tools.
- Strand 6: Think about themselves as engineers and develop an identity as someone who knows about, uses, and sometimes contributes to engineering.

### *Strand 1: Developing Interest in Engineering*

Strand 1 addresses motivation to learn engineering, emotional engagement with it, curiosity, and it gives participants a choice or a role in determining their learning (options, multiple ways). Research suggests that personal interest and enthusiasm are important for supporting children's participation in learning.

### *Strand 2: Understanding Engineering Knowledge*

Strand 2 addresses learning about the main scientific, mathematical, and technological principles essential to engineering practice. Associated educational activities address how people construct or understand the models and theories that engineers construct by generating, interpreting, and refining solutions. Concepts, explanations, arguments, models, and facts are the knowledge products of engineering inquiry that collectively aid in the description and explanation of natural and technological systems when they are integrated and articulated into highly developed and well-established solutions.

### *Strand 3: Engaging in Engineering Reasoning/Thinking*

Identifying problems, then creating and implementing solutions are central to doing engineering and to successfully navigating through life. This strand is related to engineering design process, engineers apply scientific concepts and mathematics in their work, they also apply engineering design principles (such as the recognition that most problems have several possible solutions, and the idea that new technologies may have unanticipated effects). These ideas can also be communicated through experiences in informal settings. Deepening these experiences to include mathematical and conceptual tools to analyze data and further refine the questions, observations, and experimental design may also result in participants' developing strong understanding of the practice of engineering.

### *Strand 4: Reflecting on Engineering*

The practice of engineering revolves around the dynamic refinement of engineering's understanding of the world. New technologies can always emerge, existing solutions are continuously questioned, and explanatory models are constantly refined or enlarged. Strand 4 focuses on learners' understanding of the engineering design process as a way of knowing—as a sociotechnical enterprise that advances engineering solutions over time. It includes an appreciation of how the problems engineers address and the impacts of their solutions on communities change over time as well as the learners' sense of how his or her own thinking changes. Basically, this strand involves reflecting on the broader social and historical context of engineering knowledge development.

### *Strand 5: Engaging in Engineering Practice*

Because engineering practice is a complex endeavor and depends on openness to revision, it is done by groups of people operating in a social system with specific language apparatus, procedures, social practices, and data representations. Participation in the community of science requires knowledge of the language, tools, core values, and the willingness to engage in practical ingenuity. Strand 5 focuses on how learners in informal environments are given the opportunity to design something. The goal is for students to practice managing criteria and constraints, satisfying the client and stakeholders, building their own mastery of the language, tools, and norms of engineering as they participate in innovative process and/or product development.

### *Strand 6: Identifying with the Engineering Enterprise*

Not only can educational activities develop the knowledge and practices of individuals and groups, they can also help people develop identities as engineers—by helping them to identify and solidify their interests, commitments, and social networks, thereby providing access to engineering communities and careers. This strand pertains to how learners view themselves with respect to engineering. Strand 6 is relevant to the people who, over the course of a lifetime, come to view themselves as engineers as well as the great majority of people who do not. For the latter group, it is an important goal that all members of society identify themselves as being comfortable with, knowledgeable about, or interested in engineering. This includes develop the skills/traits of the Engineer of 2020, which are: strong analytical skills, practical ingenuity, creativity, communication, business and management skills, leadership skills, high ethical standards, professionalism, dynamism, agility, resilience, flexibility, and engaging in lifelong learning.

Informal learning opportunities offer a lot of flexibility in how and what students are taught about engineering. These six strands provide a framework for K-12 engineering educators to ensure what they teach is in alignment with the broader standards of the field. The projects and activities I have designed help students engage with each of these six strands, with some more pronounced than others, so that as students increase their experiences with engineering programs that can build connections to what they already know and have done. An additional aspect that I infuse is culture, there is a culture within engineering and there is a cultural perspective that teachers and students express in the learning setting. These cultural interactions impact how engineering is taught and learned, and directly corresponds with the success or failure of students.

**Assessment of K-12 Engineering Outreach Initiatives**

There are many K-12 engineering education informal learning opportunities available today, and more will come. However, there are many gaps that need to be addressed before these efforts can be considered as broadly beneficial to the engineering community. Notwithstanding, there are common themes across current programs that should continue to exist: active learning through hands-on activities, design-based learning, involved role models, and variety in execution. Of greater concern is the need for quality assessment protocols to identify the impacts on the young participants of these programs. Each program provides their own measurements of success and knowledge development, but the validity of these measures is unknown. As time continues, it will become apparent whether students are entering college more prepared to study engineering; however, there is great opportunity now to assess and intervene before it is too late. Many of the program assessments performed lack experimental research designs and theoretical frameworks, which limits the generalizability of these program activities' success. While the effort by program coordinators to provide some type of evaluation is admirable, measurements with increased rigor needs to be applied for validity.

**Civic Identity Development**

Education should prepare each child with the skills needed to decide intelligibly how to engage life's activities; however, urban youth experience many hardships that serve as hindrances to their civic development (Ginwright, 2011; Rubin, 2007; Shiller, 2013). These hardships include the consequences of poverty, violence, and injustice, all of which besiege urban students of color inside and outside of the schoolhouse (Rubin, Hayes & Benson, 2009). Consequently, black and brown students are twice as likely as their white peers to score below proficient on national civics assessments; furthermore, a civic knowledge gap exists between the wealthiest and poorest students across the nation (Silverbrook & Allen, 2013). This unfortunate reality is important because civic knowledge is a pre-requisite for effective civic engagement in the United States, where government officials profess we exist in a democracy despite governmental affairs operating more along the lines of an aristocracy. Civic engagement is paramount to altering a political system that has disenfranchised large segments of the population based on racial prejudice.

Citizenship is a word frequently verbalized in the United States of America; however, its definition carries vastly different connotations for various people groups in this country. For example, in 2015 it was revealed that Flint, Michigan's approximately 100, 000 residents, largely black, had been (and continue to be) deprived of safe drinking and bathing water due to a cost-saving measure by a public service entity (Coleman-Adebayo & Berends, 2016). Michigan's governor Richard Snyder approved a plan switching Flint's water source from the largest body of fresh water on Earth (The Great Lakes) to the Flint River, an unregulated reservoir. The move resulted in extremely high levels of lead contamination in the water supply, which is believed to

have caused Legionnaires' disease (and the eventual death) of some residents, serious health problems for thousands of children, and countless inconveniences for all residents as they were forced to reshape their lives around their sudden clean-water deficiency. Perhaps the most obvious sign of disregard for the citizenship of Flint's residents is when the water supply of the local General Motors plant was restored to the original water source to avoid corrosion of their auto parts, while the residents continued to receive contaminated water. The story of American History resounds with similar instances, wherein people of color inhabit impoverished communities and are mistreated by governmental individuals/organizations. Thereupon, marginalized peoples seek an authentic definition of citizen and are left speculating on whether they qualify for such a designation.

**Defining Citizenship**

Engle & Ochoa (1988) define a citizen simply as "a legally recognized member of a state or nation" (p. 16). Engle & Ochoa go on to say that this legal recognition establishes a relationship between the citizen and their respective state or nation, which includes prescribed rights and responsibilities. In other words, there are principles/privileges that are entitled to citizens, and there are duties that the citizen must fulfill. Westheimer & Kahne (2004) delineate the meaning of citizenship by expanding the conception to include three kinds of citizenship, for exploring which of the three would best support an effective democratic society. The personally responsible citizen, the participatory citizen, and the justice-oriented citizen compose the categories outlined by Westheimer & Kahne (2004), each containing core assumptions that guide the respective positionality towards improving society. The personally responsible citizen believes to solve social problems and improve society, citizens must "have good character, be honest, responsible, and law-abiding members of the community" (Westheimer & Kahne, 2004,

p. 240). Whereas, the participatory citizen proposes that citizens must "actively participate and take leadership positions within established systems and community structures" (Westheimer & Kahne, 2004, p. 240). Finally, the justice-oriented citizen must "question, debate, and change established systems and structures that reproduce patterns of injustice over time" (Westheimer & Kahne, 2004, p. 240).

While the conception of the personally responsible may appear to be noble, this perspective is problematic due to its focus on individual responsibility and inherent trust that the present legislative structure is equitable. On the other hand, participatory and justice-oriented citizens do not align on how to best cultivate equalitarianism; nevertheless, each appreciate "the importance of knowledgeable, skillful, active involvement in civic and political institutions" for the betterment of society (Levinson, 2010, p. 318). Although these conceptualizations of citizenship are not exhaustive, exploring the meaning of citizenship lays the foundation for a discussion of the role of schools in shaping the civic identity of youth. According to (Carnegie Corporation of New York & CIRCLE, 2003), developing civic skills and attitudes within youth was the essential motivation for creating public schools. Furthermore, this same report proclaims, "schools are the only institutions with the capacity and mandate to reach virtually every young person in the country…of all institutions, schools are the most systematically and directly responsible for imparting citizen norms" (Carnegie Corporation of New York & CIRCLE, 2003, p. 5). As a result, schools are fundamental to the development of youth's civic identity. Whether youth are aware of civic knowledge and/or feel empowered to perform civic action largely (but not solely) depends on their experiences in their schooling environment.

**Civic Education**

Traditional practices and measures used in civic education have been insufficient for characterizing the understanding of American citizenship for urban students and students of color (Rubin, 2007; Ginwright, 2011; Shiller, 2013). Rubin et al. (2009) explain civic learning is:

> frequently investigated through statistical analyses of large national data sets, studies in which civic knowledge is generally defined in terms of students' mastery of facts about national, state, and local government, and civic engagement is assessed through indicators such as newspaper readership and intent to vote (p. 214).

Such practices do not account for students' personal attitudes and understandings of civic life and their place in society, which led researchers to begin investigating students' civic identity. Nasir & Kirshner (2003) define civic identity as a young person's sense of belonging and participation in the life of their community. Youniss et al. (1997) expand on this definition, describing civic identity as the "establishing of individual and collective senses of social agency, responsibility for society, and political-moral awareness" (p. 620). With this comprehensive definition, it becomes apparent that civic education must consider students' perceptions of a society that marginalizes urban youth and youth of color.

Researchers have shifted focus on civic engagement to the civic identity students possess, believing students' sense of themselves as citizens correlates to the level and type of (dis)engagement they experience within their community. Rubin (2007) examined a diverse group of students' thoughts and feelings related to civic experiences in and out of school, these students spanned a mixture of racial/ethnic and socioeconomic backgrounds. The result of this study is a typology of student civic identities, which are categorized as aware, empowered, complacent, and discouraged. Each of these identities is a combination of students' feelings towards the compatibility between their lived experiences and the democratic ideals of society (congruence/disjuncture), along with their feelings of responsibility to bring about change

(active/passive). Students classified as aware (congruence/active) believed change is needed for equity and fairness, empowered students (disjuncture/active) believed change is a personal and community necessity, complacent students (congruence/passive) thought no change is necessary and that all is well within the U.S., while discouraged (disjuncture/passive) student felt no change is possible and that life in the U.S. is unfair. These findings have compelling implications for the way youth, particularly those from historically disenfranchised groups, have been characterized regarding civic participation. Their reluctance to participate in traditional civic activities (e.g., volunteering, joining youth clubs, etc.) could be the result of their disbelief that governmental entities are concerned for their well-being (Rubin, 2007; Ginwright, 2011).

Youth civic identity development must be situated in the larger context of school and societal patterns of racial and socioeconomic inequality. Within this framework, it becomes clear that urban youth of color need alternative methods for defining citizenship. In this vain, Ginwright & James (2002) suggest helping youth to analyze power dynamics in social relationships as useful for stimulating optimism in urban youth of color when discussing practical actions toward the improvement of society. Shiller (2013) states that urban youth have been shown to be civically engaged when the focus of their activities involves positively impacting the condition of their community, rather than only talking about civic action and learning civic facts. This assertion has great implications for the way urban youth are educated concerning citizenship, in fact, this encourages a learning-by-doing model where students are scaffolded through a process of building civic awareness and participating in civic events (Youniss, 2011).

## 21st Century Citizenship

Engle & Ochoa (1988) declare "the strength of democracy lies in the broad and intelligent participation of citizens in the affairs of the society at all levels and in all walks of life" (p. 18). Contrast this perspective with data put forth by Delli & Keeter (1996) that displays "women, African Americans, the poor, and the young tend to be substantially less knowledgeable about politics than are men, whites, the affluent, and older citizens" (p. 271). This phenomenon is what many researchers have termed the civic knowledge gap, and even argue it is more pertinent that the well-known academic achievement gap (Levinson, 2010; Shiller, 2013; Silverbrook & Allen, 2013). Though civic knowledge is insufficient to establish one's own civic identity, it is certainly a precursor to healthy civic attitudes and effective civic engagement. Levinson (2010) echoes the sentiments of Engle & Ochoa when she insists an individual's civic and political behavior are "concomitantly central to the strength, stability, and legitimacy of democracy;" furthermore, she advocates for the "civic and political empowerment of poor, minority, and immigrant individuals" (p. 328-329). The need for empowerment implies a present sense of powerlessness exists among these people groups, highlighting the absence of basic knowledge, commitment to the democratic ideal, basic intellectual skills, and political skills, which Engle & Ochoa (1988) propose as necessary for intelligible democratic citizenry. Thus, Levinson's call for civic empowerment is appropriate as we have a large segment of our population that are ill-equipped to satisfy the responsibilities assigned them, as they have been forsaken by sociopolitical/economic structures that uphold inequitable practices.

Fortunately, there are youth-centered stakeholders (i.e., researchers, teachers, community-based organizations) that have not allowed past/present injustices to deter their aspirations for future youthful civic engagement, through which an improved democracy can be

formed. Critical civic praxis is a research paradigm that centers on the civic engagement of urban youth. These youths become "engaged with ideas, social networks, and experiences that build individual and collective capacity to struggle for social justice" (Ginwright & Cammorata, 2007, p. 693). Youth are trained on how to analyze structural systems that hinder the health of their community, while also being empowered to act as change-agents improving the condition of their living environment (Ginwright & Cammorata, 2007). Westheimer & Kahne (2004) describe that critical civic praxis helps people to "critically assess social, political, and economic structures that uphold inequality and consider collective strategies for change that challenge injustice" (p. 3). Such paradigms work to equip youth with tools to activate what Giroux (1996) characterizes as strategic resistance (conscious action to achieve a common good), instead of oppositional resistance (deviant behavior).

Schools can greatly improve their preparation of urban youth to be 21st century citizens by emphasizing civic competency just as much as reading and math competencies (Youniss, 2011). Classrooms ought to become eligible spaces for public dialogue around the current political issues. Rubin et al. (2009) explain "school contexts and classroom practices are deeply imbedded in shaping [civic] identities in particular way;" accordingly, teachers and administrators should encourage participation in student government groups, along with assisting students to establish explicit connections between class content and their lived experiences (p. 220). Said differently, "the challenge facing schools is to make use of pedagogical approaches that link literacy to social action and civic participation" (p. 167). Educators in urban settings will need to reform history education to include a more comprehensive analysis and empowering civic narrative for the students they serve (Levinson, 2010). Classroom activities must allow for guided civic learning experiences, where students select a community problem they desire to

change, are trained on how to understand the larger forces behind the issue, and are given the opportunity to present their analysis and solution through expressive and creative means (Rubin & Hayes, 2010).

Despite the potential for schools to serve as healthy settings for civic education, researchers are exploring out-of-school sites of civic engagement that can uplift urban youth. These alternative avenues for youth civic identity development can provide opportunities for relationship building, societal critique, and building political efficacy (Shiller, 2013). Additionally, Ginwright (2011) suggests community organizations often provide pathways to critical consciousness, to action, and to well-being, each contributing to the restoration of civic activity in communities occupied by people of color. Shiller (2013) emphasizes the benefit of programs that allow students to participate civically in an authentic circumstance, rather than reading from literature or gaining skills that could not immediately be exercised.

A review of literature focused on youth civic identity development and civic engagement reveals the potential for reducing the civic knowledge gap among urban students of color; moreover, addressing the civic empowerment gap seems essential to the prosperity of our nation's democracy. While "Americans have shared a vision of a democracy in which all citizens understand, appreciate, and engage actively in civic and political life," citizens of color and those with moderate to low incomes have been systematically disabled from enacting this vision. This is especially true when examining the preparation for citizenship provided by public schools. Nevertheless, there is hope for the future. In fact, there is a considerable amount of studies that demonstrate the ability of disadvantaged youth to critique the structures and circumstances that oppress them and act toward dismantling these barriers.

As the details of civic educational practices will differ due to the variance in any given setting, some of the consistent recommendations for civic learning include: 1. Discussion of meaningful, contemporary, and controversial issues, 2. Participation in guided experiential civic learning, and 3. Develop practical solutions constructed by students. These civic experiences are likely to increase students' sense of personal and political efficacy and trust. Similarly, Levinson (2010) explains this work "will also help strengthen local communities, both via the direct work that students accomplish and by building a new generation of mobilized, empowered adults" (p. 337). Still, further investigation is necessary to illicit the connections between the civic knowledge/achievement gaps and the academic achievement gap. It is tempting to debate which of these is more prominent, but quite frankly both must be concurrently diminished. For it is certainly possible to teach in a manner that equips urban students of color to succeed in a broken system, while actively laboring toward reshaping that system to be more equitable.

**Sociopolitical Development**

Beyond the call for improved civic education and engagement for urban youth of color, there is growing interest in the quality of these civic experiences. Stemming from a paradigm that acknowledges modern oppression towards youth of color, some scholars are emphasizing a method of education that seeks to inform students from disenfranchised and marginalized cultures on the systematic injustices in place to maintain their misfortune. Moreover, the aim for these students is not just awareness, but that they will become equipped to question, analyze, and solve problems in their everyday lives. This burgeoning instructional approach is concentrated on furthering sociopolitical development (SPD). Watts, Williams, & Jagers (2003) summarize SPD as a theory that "expands on empowerment and similar ideas related to social change and activism in community psychology-oppression, liberation, critical consciousness, and culture

among them" (p. 185). In short, SPD is concerned about education *and* activism toward a just society.

Ginwright & James (2002) suggests barriers to democratic participation are the greatest problems facing youth in communities of color. Societal hindrances like "racism, mass unemployment, pervasive violence, and police brutality pose serious threats to youth and their families. These toxins impede productive development for young people…and place them at a greater risk than those living in stable and safe communities" (p. 28). The issues are often imperceptible to young people (and even adults), requiring skills and assistance to make them more discernable. Researchers, educators, and practitioners can cultivate sociopolitical competencies to help youth understand the root causes and the solutions to social problems. Ginwright & James (2002) provide a list of sociopolitical competencies and suggest fostering these capabilities can progress institutional change: sociopolitical development and analysis, social and community problem solving, decision making, healing and spiritual development, community well-being and just institutional practices (p. 41).

Social analysis, the goal of SPD, fosters awareness of youth to recognize the relevancy between details of their lived experiences and sociohistorical trends. Watts & Guessous (2006) propose "social analysis…is akin to critical consciousness, and critical consciousness is a politicized version of critical thinking" (p. 75). This critical consciousness becomes imperative for marginalized youth to be able to expose socially unjust practices/institutions, and therefore create equitable situations.

The literature presented in the preceding section revealed not just bad experiences, but unfair circumstances that black boys have to survive before any profession seems feasible, not to mention engineering. This scholarship has impacted my disposition and teaching practices when

I teach engineering to black boys. Regarding this project, I scrutinized the language I plan to use when describing engineering and its impact on the world and its potential for black boys. I had to think deeply about the ways engineering is traditionally taught and how this may mirror the power dynamics black boys endure in their everyday lives, how can I shift to providing instruction that is empowering and centralizes their concerns instead of the concerns of the field. Engineering cannot rescue black boys, but there is potential for K-12 engineering initiatives to offer learning opportunities that re-ignite a delight in learning where academic interests have long been removed. Engineering educators, though new to the K-12 realm, should not ignore the social realities students endure and it would be mutually beneficial for the field to aspire to do more than just offer access to distressed youth. In this vein, the next section will examine literature related to the proposed research methods. There is an abundance of scholarship on research that pursues more just learning experiences inside and outside of the classroom setting. Specifically, I propose to do a critical autoethnographic study. Bearing in mind the influence educators have toward their pupils, the following literature advocates knowing one's self to be more effective in shaping equitable learning environments.

## Autobiographical Ethnography

This section will offer further rationale for the selection of autoethnography (AE) as the methodology and method of inquiry within this study. With roots in ethnography and bearing many similarities to narrative inquiry, self-study, and hermeneutics, autoethnography involves a systematic analysis of one's personal experiences within a particular culture, community, or context (Ellis, Adams, & Bochner, 2011; Patton, 2002; Reed-Danahay, 1997). Ellis & Bochner (2000) describe autoethnography as "an autobiographical genre of writing and research that displays multiple layers of consciousness, connecting the personal to the cultural (p. 739)."

Therefore, elements of autobiography are present but autoethnographic research aspires to do more than share one's personal narrative. Rather, these very personal and critical anecdotes aspire to advance sociological understanding given some cultural context (Sparkes, 2000). Furthermore, researchers utilizing autoethnography suggest that genuinely understanding one's self is a prerequisite for understanding other.

Starr (2010) explains the value of situating ourselves in our work, "the process of self-exploration and interrogation aids individuals in locating themselves within their own history and culture allowing them to broaden their understanding of their own values in relation to others" (p. 1). Regarding this dissertation, as a black male, I have an insider perspective into the realities that must be navigated to succeed in a racialized society; predominantly, a demographic that has been mercilessly underserved and over-criminalized in the educational system (Harper & Wood, 2015; Ferguson, 2001). As an engineering student and educator, I have some understanding of the desired characteristics of future engineers expressed by participants with the engineering community (e.g., professional societies, academic institutions, etc.); as well as, contemporary reforms concerning the aims and processes of the educational experience of the engineer. Engineering educators must consider how the cultural background of students fuse (or separate) with the epistemological and ontological formation of an engineer. My intent is repurposing the field of engineering education, exhorting engineering educators to critically evaluate how culturally relevant teaching can be exerted in this field. Only when this is accomplished, in my opinion, will the participation in engineering truly be broadened. Since racial/ethnic diversity and justice are core concerns to me as a black man in America, I intentionally use my scholarly and professional pursuits as instruments for advocacy toward holistic equity in the advancement of engineering literacy for pre-college students.

Autoethnography is also a dissent from exploitative research practices; whereby members of academe would exercise "colonialist, sterile research impulses of authoritatively entering a culture, exploiting cultural members, and then recklessly leaving to write about the culture for monetary and/or professional gain, while disregarding relational ties to cultural members" (Ellis et al., 2011, p. 274). This common approach to conducting research often reifies and perpetuates domineering power dynamics within and beyond the research community (Hughes & Pennington, 2017) Autoethnographic chronicles challenge the epistemic authority of observational science and researcher objectivity to centralize the subjectivity, ideologies, and relational connectivity of the researcher (Ellis et al., 2011; Starr, 2010; Wall, 2006). Researchers inherently have biases due to their sociocultural paradigm, it seems profitable to publicly catechize this paradigm to authentically represent obscure cultural processes. This investigation into one's point of view is a necessary analysis for educators desiring to counteract complex racial inequities, yet it demands reflexivity of self and practice. Starr (2010) affirms "autoethnography allows the educator the opportunity to effectively acknowledge the pragmatic demands of teaching and of everyday life to take stock of experiences and how they shape who we are and what we do" (p. 4). Thus, the introspection articulated through autoethnography is not principally about the self, rather it is a lens through which one seeks understanding of others' cultural positioning and to enhance one's vocation within the context of power dynamics and social control (Chang, 2008; Pfohl & Gordon, 1986; Starr, 2010).

Perhaps it is not coincidental that the research approach I consider most appropriate to elucidate my experiences within a marginalized culture, is itself marginalized within the broader research community (Holt, 2003). Autoethnography is highly criticized for using self as the primary source of data and promotion of personal narratives (Ellis, 2004). Still, others are

resistant to its inclusion of artistic forms of writing structure and representation (Patton, 2002). Despite this antagonism from the research community, there is a multitude of scholars dedicated to legitimizing autoethnographies as a methodology and a method within the qualitative research domain (Ellis & Bochner, 2000; Hughes & Pennington, 2017; Starr, 2010). It is in this vein that I seek to extend the practice of autoethnography within engineering education research. Downey & Beddoes (2010) encouraged engineering educators to utilize "personal geographies" as a tool to explore their teaching in a global engineering context. Moreover, Streveler, Borrego, and Smith (2007) have called for researchers in engineering to learn and implement the methods and paradigms of educational research, of which autoethnography is a part, to improve the rigor of engineering education research. Reinforcing the relationship of K-12 engineering education to the broader work of education, this project aims to critically evaluate theory and practice within K-12 engineering education.

Notwithstanding, there is much variance in perspectives on the criteria that ensure quality and rigor in autoethnographic research. Amid these approaches to legitimation, I have chosen to adhere to criteria originally proposed by Guba & Lincoln (1989) and then extended by Starr (2010), as these criteria follow current qualitative constructs. In other words, these criteria contextualize autoethnography within present standards that qualitative researchers are familiar with (Hughes & Pennington, 2017). The revised list of "authenticity, methodological, and rigor criteria" includes fairness, ontological authenticity, educative authenticity, catalytic authenticity, tactical authenticity, methodological rigor, and aesthetic rigor (Hughes & Pennington, 2017, p. 95).

a. *Fairness* is "the extent to which the presence of different values and different social constructions of reality are named during the evaluative writing process. This self-evaluation process is integral to credible writing that represent conflicts over claims, concerns, and issues" (Hughes & Pennington, 2017, p. 96).

b. *Ontological authenticity* is "the extent to which a researcher's own values and social constructions of reality are improved, matured, expanded, and elaborated, in that they now possess more evidence-based information and have become more comprehensive, complex and/or sophisticated" (Hughes & Pennington, 2017, p. 96).

c. *Catalytic authenticity* is "the extent to which action is simulated and facilitated by the evaluative writing processes, whereby the purpose of the self-evaluation is some form of action or decision making" (Hughes & Pennington, 2017, p. 97).

d. *Educative authenticity* is "the extent to which participants' (i.e., autoethnographers' and their readers') sense(s) of understanding and appreciating the social constructions/assumptions of *others* outside their stakeholding affinity groups are challenged and enhanced" (Hughes & Pennington, 2017, p. 97).

e. *Tactical authenticity* is "the extent to which stimulation and facilitation of action are evoked by the critical self-evaluation process to the next step of empowerment to act on the needed change(s) that emerged" (Hughes & Pennington, 2017, p. 98).

f. *Methodological rigor* is "the extent to which methodological self-evaluation standards provide a bridge between more traditional conceptions of validity, reliability, and generalizability and standards for methodological rigor that are more reflective of interpretive and constructivist inquiry" (Hughes & Pennington, 2017, p. 98).

g. *Aesthetic rigor* is "the extent to which an accepted standard for literary quality is adhered to, including the standard juxtaposition between critical social research and evocative literature" (Hughes & Pennington, 2017, p. 99).

These criteria are not rigidly specific to allow flexibility for the researcher to satisfy each criterion in a manner that is appropriate for their study; nevertheless, they impose on the researcher intentionality in the design of the project and accountability to the reader (and research community) for the way new understandings are presented.

**Teaching to Transform**

Black male students need supportive, collaborative, and learner-centered environments to enhance their cognitive development. An important note is that the pedagogical approaches that will assist the learning process of black male students are beneficial to all students (Ladson-

Billings, 1995); yet, quality instructional practices and quality teachers have been eluding the classrooms filled with black students for decades (Kozol, 1991; Milner, Pabon, Woodson, & McGee, 2013). As engineering expands its presence in K-12 education, I propose using a critical race pedagogical approach. Engineering as a sociotechnical discipline provides a natural pathway to advancing critical thinking skills and awareness of the ever-changing world in which we live. Moreover, there is potential to upend increasingly rote teaching practices for instruction that connects with the social contexts of poverty, violence, and dysfunctionality many black and urban youth navigate daily (Beder, 1999; Cunningham & Lachapelle, 2014; Miaoulis, 2010). The next section of this chapter will present the theoretical foundations of critical race pedagogy and how I planned to apply it in this project.

Although critical race theory (CRT) was conceived in legal studies, for more than two decades scholars in education have been utilizing CRT as a framework to analyze and address educational equity. Ladson-Billings & Tate (1995) pioneered the use of CRT in education, understanding that the schooling landscape, particularly within public schools, is a microcosm of our nation and maintains its social relations (Lynn, Jennings, & Hughes, 2013). Hence, the value of this expansion, "from issues of pedagogy, curriculum, to leadership, policy, and school politics, CRT in education highlights the persistence of racism across education" (Ledesma & Calderon, 2015, p. 2). Establishing CRT in education allows for comprehensive analysis of the interrelationship between racial identity and citizenship, as our nation alleges widespread equitable schooling and preparation for its citizenry (Ladson-Billings, 1998). While reports like The Civic Mission of Schools (2003) proclaim "for more than 250 years, Americans have shared a vision of a democracy in which all citizens understand, appreciate, and engage actively in civic and political life" (p. 4); tragically, citizens of color and those with moderate to low incomes

have been systematically disabled from enacting this vision. This is *especially* true when examining the preparation for citizenship provided by public schools, where some children are educated to be governing officials and others are trained for governmental submission (Kozol, 1991). Thus, CRT in education is generally understood as "a framework or set of basic perspectives, methods, and pedagogy that seeks to identify, analyze, and transform those structural, cultural, and inter-personal aspects of education that maintain the subordination of Students of Color" (Solórzano & Yosso, 2000, p. 42).

As CRT developed a tenable presence in educational research, scholars began conceptualizing the ways principles of CRT translated into pedagogy. This fusion of CRT and instructional practice became known as Critical Race Pedagogy (CRP), and "could be defined as an analysis of racial, ethnic, and gender subordination in education that relies mostly on the perceptions, experiences, and counter-hegemonic practices of educators of color" (Lynn, 1999, p. 615). CRP was aptly named and defined in accordance with the principles of CRT, mostly classifying race as prominent in comparison to other forms of repression. The preeminence of race was intentional and in direct contrast to critical pedagogy, which many scholars believed to have favored class as a more salient factor than race or gender in understanding domination and supremacy in our society (Allen, 2006, Ellsworth, 1989; Lynn, 1999). CRP was initially formed out of Lynn's work studying black teachers who were influenced by tenets of CRT and Afrocentricity in shaping the way they taught black youth. Thus, this project is in direct alignment with the original aims of CRP. However, this project is designed with the hope that its findings will be profitable for white educators that are willing to engage counter-hegemonic practices in addition to educators of color.

CRP should be thought of as a theoretical paradigm, for it is not a set of classroom instructions or best practices, rather a philosophical perspective that undergirds the teaching strategies implemented by an instructor. Critical Race Pedagogues maintain four core beliefs, namely: 1. Racism is endemic in American society; 2. There exists a culture of power that privileges white people and white cultural norms; 3. Educators of color must reflect on their privilege as researchers (in civilian community) and simultaneous exclusion due to their race (in academic community); and 4. Explicit pursuit of action and advocacy for justice and equity in education (Lynn, Jennings, & Hughes, 2013). Some educators and researchers (Gay, 2002) would consider such dispositions as unhealthily politicizing education, researchers employing CRP rejects the sentiment that education is apolitical and claims only to be forthright in acknowledging one's political posture. CRP is purposeful in its scrutiny of racism and the resulting power imbalance, naturally such dialogue is facilitated to edify black people and accentuate their dignity *within and beyond* the classroom. These aspirational outcomes are pursued by focusing more attention on the practice of teaching as a moralizing and humanizing process rather than on teachers' critiques of racism and inequality (Lynn, Jennings, & Hughes, 2013). So, while a heightened awareness and insight into the inequitable conditions impeding the well-being of blacks is desired, critical race pedagogues recapitulate Rev. Dr. Martin Luther King, Jr. in asserting 'intelligence plus character' as the true goal of education (King, Jr., 1947).

## Understanding Black Americans: Black Critical Theory & African American Male Theory

### Black Critical Theory (BlackCrit)

CRT has many sub-groupings that scholars adopt to indicate a perspective within race relations or regarding the intersecting aspects of identity, like race and gender, class, religion, etc. The original impetus of these designations was to extend CRT to analyses beyond black-

white race relations (Delgado & Stefancic, 2017), and they have boldly elucidated the material and nonmaterial manifestations of racism in various marginalized communities. These communities include Latin@s (LatCrit), Black Americans (BlackCrit), Asian Americans (AsianCrit), and American Indians (TribalCrit), among others. Since each of these sub-groups are rooted in CRT, they can conveniently be utilized as frames of reference for CRP. Black Critical Theory, or BlackCrit, is advantageous for this project because it provides specificity to the ways black people are subjugated in American society.

BlackCrit surpasses theorizing racism to delineate a theory of blackness (Dumas & ross, 2016). As race is socially constructed and yet has tangible (dis)advantages, blackness is not constant which inevitably complicates the identities and experiences of black people. Actress Ellen Holly depicted these complexities when she wrote about what it means to be black:

> Black is not a color of skin. It is a unique experience shared by Negro Americans, however varied they may be, that sets them apart from any other group and results in a certain kind of psychological adjustment that no other group has to make—namely, the adjustment of learning how to survive, and perhaps even to flourish, in an atmosphere that is almost totally hostile" (as quoted in Young, Jr., 1969).

This mention of the uniqueness of the black experience necessitates a specialized framework for inquiry. Likewise, Smith (1993) declares, "in America, race matters, but blackness matters in more detailed ways" (p. 76), alluding to what Dumas & ross (2016) explain as the tendency to focus on white supremacy when discussing race without mention of enduring black suppression. BlackCrit in education is primed to assist scholars in evaluating "how social and education policy are informed by antiblackness, and serve as forms of anti-Black violence, and following from this, how these policies facilitate and legitimize Black suffering in the everyday life of schools" (Dumas & ross, 2016, p. 419). Attaching BlackCrit to CRP can mobilize educators

toward praxis that redress barbaric norms facing black youth, such as, indigence, the school-to-prison pipeline, substandard school funding.

Just like CRP, BlackCrit has its own foundational concepts that form its theorization that are slight modifications and/or minimal additions to the original principles of CRT. Dumas & ross (2016) put forth three claims that comprise their articulation of BlackCrit in education: (i) Antiblackness is endemic to, and is central to how all of us make sense of the social, economic, historical, and cultural dimensions of human life, (ii) Blackness exists in tension with the neoliberal-multicultural imagination, and (iii) BlackCrit should create space for Black liberatory fantasy and resist a revisionist history that supports dangerous majoritarian stories that disappear Whites from a history of racial dominance, rape, mutilation, brutality, and murder. Dumas & ross describe antiblackness as "a broader antagonistic relationship between blackness and (the possibility of) humanity" (p. 429). Understandably, many may find it hard to conceive, and even more so accept, the idea of antiblackness; especially, given the proliferation of colorblindness, meritocracy, and individualism. Nevertheless, such unbelief does not make the existence of antiblackness invalid. Antiblackness goes beyond interpersonal prejudice, it is the inability of non-blacks to see blacks as more than slave; thereby, causing active participation or silent complicity in the literal and figurative death of black people.

The second claim of BlackCrit in education is essentially a critique of politicking in American history. During the 1960s there was a period of retributive actions taken by the government, like the development of equitable laws and programs designed to explicitly counterbalance discrimination toward blacks; soon after, the government disbanded this trend in favor mantras advocating universal equal opportunity. Neoliberal and multicultural initiatives seem just, yet they do nothing to boost the power and social status of the most vulnerable in our

society (Au, 2014; Giroux, 2004). Furthermore, "persistent joblessness, disparities in educational achievement, and high rates of incarceration are all seen as problems created by black people, and problems of blackness itself" (Dumas & ross, 2016, p. 430). These falsities perpetuate antiblackness, as the populace, and even fellow black Americans, conclude the disempowering status of blacks as deserved.

Thirdly, BlackCrit in education ought to make room for hope and imagination of true liberation, while simultaneously retaining the recognition that white capitalists were (and continue to be) responsible for constituting dehumanization and the ignominy of blacks. The latter part of the third foundational idea is a response to the inclination of Americans to acknowledge black Americans as the descendant of enslaved Africans who suffered egregious brutality but omit exactly who facilitated this long-standing degradation. BlackCrit in education was proffered as an analytic approach to examining antiblackness in school policy and practice. This project will expand the purview of BlackCrit to account for out-of-school examples of antiblackness that effect the learning ability of black youngsters (e.g., food insecurity, poor and segregated housing). BlackCrit pedagogues must also possess vision and creativity to "inspire youth to understand that community conditions are not permanent, and that the first step in making change is to imagine new possibilities" (Ginwright, 2011, p. 37). In this, the interdisciplinarity of BlackCrit is optimized. In fact, there is a considerable amount of literature that demonstrates the ability of systemically-neglected youth to critique the structures and circumstances that oppress them and act toward dismantling these barriers (Ginwright & Cammorata, 2007; Rubin, 2007; Shiller, 2013, Youniss, 2011). BlackCrit Pedagogy (BCP) studies the implications of antiblackness to devise more thoughtful and comprehensive resolutions, produced and enforced in conjunction by educators and their students. BCP for black

boys in engineering identifies the presence of antiblackness in engineering culture (including its specific manifestations), designs curricula that affirms blackness in engineering, and considers ways to cultivate a supportive engineering community for black boys.

**African American Male Theory**

As a black man, I can attest to the dissimilar ways in which blackness is understood, experienced, and expressed between black males and black females. Thus, it follows that an additional theoretical framework able to ruminate racism and its peculiar conjunction with gender dynamics is crucial for this project. Despite the capability of BlackCrit to operate as a theoretical lens to explore the intricacies of the lived experiences of black Americans, its analysis is only partial, though significant and essential. Bush & Bush (2013a) expound on this conclusion as they suggest:

> While the stories of oppressed people should never be forgotten and are necessary for scholars to thoroughly investigate, we encourage scholars to move away from damage-centered and reactionary approaches that tell the stories of native peoples only in relationship to those who have oppressed them which tactically conveys that their existence and importance are bestowed on them by their oppressors. (p. 9-10)

This becomes expressly apparent when reviewing the scholarship on black boys and men, which predominantly concentrates on their challenges and underperformance (Bush & Bush, 2013a; Harper, 2010a). Notwithstanding "anti-deficit" scholarship (Harper, 2010b; Hrabowski III, Maton, & Greif, 1998) which focuses on black males that have successfully navigated the K-20 schooling system, framing analyses of black males basically in terms of their achievement in a broken educational system is inadequate.

The context that is used to study black males needs to be broadened to include the successes and failures of black males, within and outside of their educational experiences; as

well as, the external factors that contributed to their advancements or setbacks. Bush & Bush (2013a) introduce what is absent from current research on black males, "we aspire for a more dynamical lens and thereby borrow liberally from ecological systems theory, which allows for more fluid interaction and juxtaposition of abstract and concrete concepts, environments, time periods, and other phenomena" (p. 1). This led the preceding authors establishing African American Male Theory (AAMT). They describe AAMT as a theoretical framework that vocalizes "the position and trajectory of African American boys and men in society by drawing on and accounting for pre- and post-enslavement experiences while capturing their spiritual, psychological, social, and educational development and station" (p. 6). AAMT is a fulsome frame of reference, considering the black male individual and his environment, American history and world history holistically.

AAMT is grounded in ecological system theory, and modifies Bronfenbrenner's (1986, 1989, 2005) interconnected environmental systems model to develop "a multidisciplinary and trans-disciplinary approach to theorizing…and guide for practice" relative to the lives of black males (Bush & Bush, 2013b). Urie Bronfenbrenner presents five systems that shape human development, namely, the microsystem, mesosystem, exosystem, macrosystem, and chronosystem. The microsystem captures the individual's own biology, personality, beliefs and perceptions, and intellectual gifts and the interactions with familial, home, peer groups, neighborhood, and school environments. The mesosystem makes the links between the environments of the microsystem (e.g., home and school, family and peers). Exosystems are external environmental settings and community factors, such as a parent's place of employment, that affect an individual even if that person is not a direct participant. The macrosystem looks at larger cultures or systems, which can be physical, emotional, and ideological that may affect

individual development (e.g., national culture and economic culture). Finally, the chronosystem considers the pattern and arrangement of the environmental events and transitions and the sociohistorical context in which they occur over time (e.g., change in career opportunities for women over last few decades) (Bush & Bush, 2013b). The interrelationships between these systems can be seen in Figure 3. This ecological systems model situates a child's development inside complex and multifaceted social dynamics, both within and beyond the control of the child. As black males navigate our racialized society that beget rampant fatherlessness, intergenerational poverty, and school labeling and criminalizing practices (among other ills), one can appreciate the value of this diagnostic scheme for interpreting their experiences (Livingston & Nahimana, 2006).

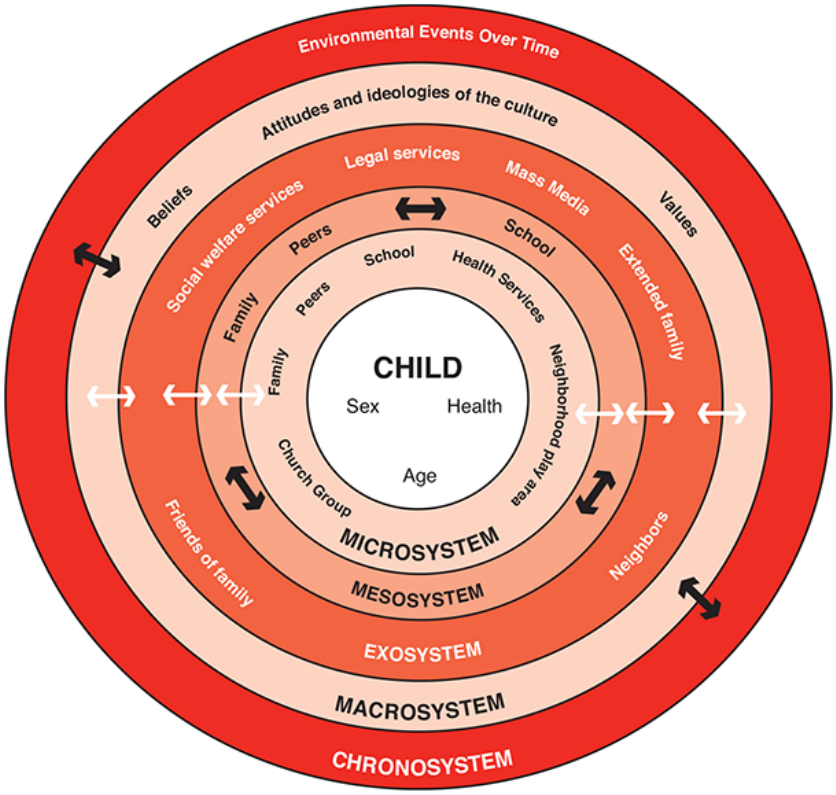




Figure 3: Bronfenbrenner's Ecological Systems Theory

AAMT contains two noteworthy changes to Bronfenbrenner's model. First, the microsystem is split into two categories; biology, personality, and perceptions and beliefs are designated as the inner microsystem, deeming the impact of family, peers, neighborhood, and school environments as the outer microsystem. As a result, the mesosystem is expanded to account for the relationship(s) between the inner and outer microsystems. Second, an additional system is added, the subsystem, to acknowledge the influence and involvement of the supernatural and spirit, the collective will, collective unconscious, and archetypes (Bush & Bush, 2013b). This additional system heeds research that shows a significant number of black males engage in spiritual practices (Baker-Fletcher, 1996; Byfield, 2008). Figure 4 provides a visualization of AAMT.

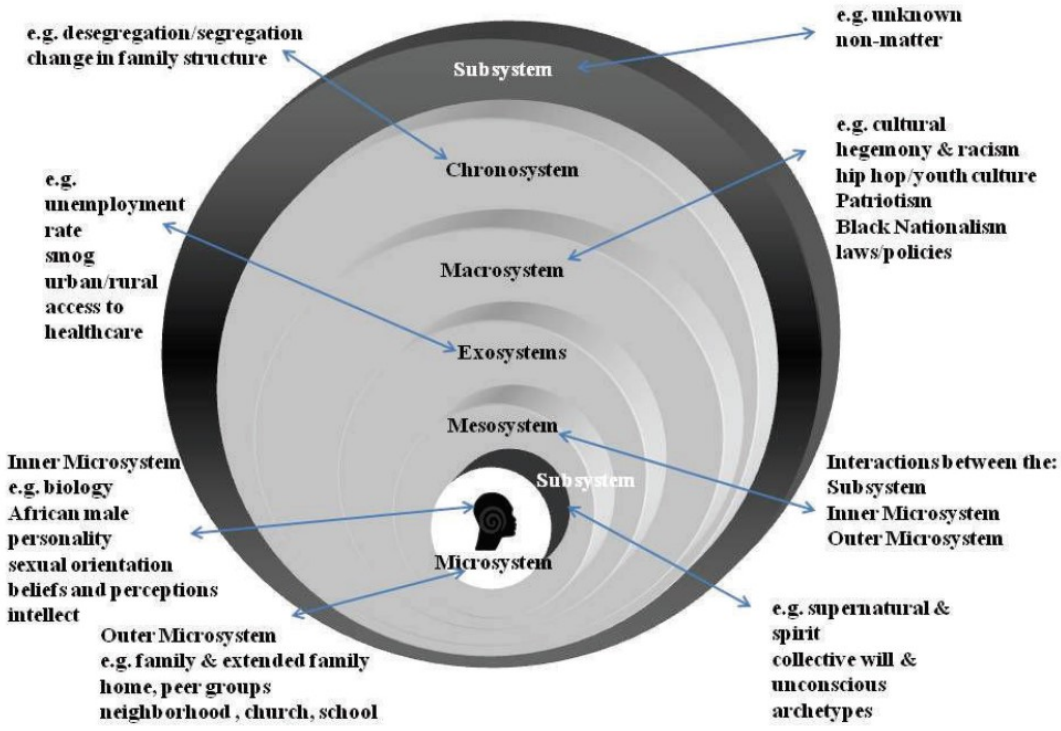


Figure 4: African American Male Theory's Ecological Structure

AAMT affirms a revisionist historical perspective and inclusive interdisciplinary research and practice to abolish demeaning ideologies and behaviors toward black boys and men. Admittedly, such work will not be easy but is nonetheless imperative. The theory proposed by Bush & Bush is an audacious effort to enhance literature on black males, and despite it being inceptive, is suitable for this study. Table 1 displays the affirmations of AAMT with brief descriptions.

Table 1: Six tenets of African American Male Theory

| *Tenet* | Exposition* |
|---|---|
| *The individual and collective experiences, behaviors, outcomes, events, phenomena, and trajectory of African American boys and men's lives are best analyzed using an ecological systems approach* | Building upon what happens in nature, an ancient and current African worldview, and Bronfenbrenner's work, AAMT suggests that African American boys and men exist in a symbiotic and bidirectional relationship with other beings, matter, concepts, and phenomena. Accordingly, a framework is needed that can describe and analyze the interrelated structures, systems, and processes that occur in these dynamic and multidimensional environments that influence and shape the development, experiences, outcomes, and trajectory of African American boys and men. |
| *There is something unique about being male and of African descent* | Whether it stems from nature, nurture, or other… AAMT also is concerned with examining and discovering what is distinctive about this population as a group and individual distinctions within the group. |
| *There is a continuity and continuation of African culture, consciousness, and biology that influence the experiences of African American boys and men* | African American Male Theory asserts that the study of African American men and boys must be anchored in Africa, requiring multi-disciplinary and trans-disciplinary approaches as the implications of possible connections permeate the physical and social sciences and humanities. |
| *African American boys and men are resilient and resistant* | AAMT embraces resilience theory (Holling, 1973) and vehemently opposes deficit paradigms, thinking, and practice. In short, resilience theory is concerned with and addresses the ability, capacity, and powers that people or systems exhibit that allow them to rise above adversity. AAMT approaches all forms of resistance and opposition demonstrated by African American boys and men as a strength though some of its |

| | |
|---|---|
| | manifestations may be counterproductive to what is viewed as being successful or productive in White mainstream society. |
| *Race and racism coupled with classism and sexism have a profound impact on every aspect of the lives of African American boys and men* | AAMT is particularly interested in how it impacts the lives of African American boys and men. Moreover, AAMT is also interested in understanding how being male and of a certain class may gain some African American boys and men privilege in some spaces and thereby seeks to be in dialogue with such perspectives. |
| *The focus and purpose of study and programs concerning African American boys and men should be the pursuit of social justice* | The aim is not necessarily to respond to cultural hegemony and racism but rather to explicitly account for it as AAMT works to draw upon the historical and current culture, conscious- ness, and community to determine what is social justice for African American boys and men. |

* Each exposition is one or more statements from (Bush & Bush, 2013a) curated by this author to be a summative explanation of the linked principle.

AAMT appears to be complementary to BlackCrit, taken together this combination of frameworks formulate a comprehensive lens to examine how identity and culture affect my teaching practice. The assertion of anti-blackness being endemic to BlackCrit is a direct challenge to ideals of equal opportunity and support supposedly present in public and private institutions, which leads naturally to the assertion of AAMT that the focus and purpose of study and programs concerning African American boys and men should be the pursuit of social justice. Both frameworks hone in on the study of black people, AAMT just narrows the focus to disaggregate the gender dynamics that manifest with black males. These connections informed the contextualization of engineering examples in my curriculum and they motivated the inclusion of non-engineering topics like politics and civics because one cannot study the experiences of black males appropriately without considering their relationship with broader society. In addition, my analysis of conversations with students and my own reflections was richer since I could comprehend the antagonistic culture black males have to navigate.

# CHAPTER 3: METHODOLOGY AND RESEARCH DESIGN

## Critical Research is Critical to Research

Current scholarship on black males in engineering primarily investigates the factors contributing to (un)successful degree completion (Burrell et al., 2015; Flowers III, 2015; Moore, 2006; Strayhorn et al., 2013; Tolbert, 2016), neglecting our stories of being denied entry into the profession or accepted only to engage more prejudice and discrimination (Wharton, 1992). Within this context, the way black males are exposed to and taught engineering is very important. For example, black males should be made aware of the prejudices and structural barriers that have derailed their predecessors, in addition to preparation for overcoming these unfortunate obstacles. There is also a shortage of literature regarding the experience of a black man teaching engineering, especially when the students are black males themselves. Same-race elementary teachers have been shown to have a significant impact on reducing the high school dropout rates of black boys (Gershenson et al., 2017), provoking intrigue to investigate the impact of same-race and same-gender teachers on black boys. I insist it is necessary for me, as a black, male engineering teacher, to speak from the first-person perspective to emphasize my experience and history with structural racism and systemic oppression. Further, I believe acknowledgement of the structures keeping racism and oppression alive should be present in any effort to broaden the participation of black males engineering, and underrepresented racial/ethnic minority populations more generally. Critical autoethnography is predisposed to satisfying these recommendations, purposefully centralizing the narrative of a racial minority and emphasizing the scholastic ramifications of a racially-biased society.

This study is a report of my implementation of a pedagogy that is sensitive to the lived experiences of a historically marginalized community—black males. My identification with this community and the sociohistorical context of the United States provide an intriguing circumstance for examining reflexive teaching in engineering. Qualitative research is best suited for the proposed inquiry because of its exploratory nature, prioritizing of in-depth understanding of study participants, and desire to reveal of unseen human attributes (i.e., motivation, perception, etc.). I utilized critical autoethnography as my research procedure to explicate my own rationale, intentions, and actions when enacting a critical race pedagogy (CRP) in pursuit of a more just and liberatory learning experience for black males engaging engineering. Critical autoethnography is a blend of critical research and autoethnography.

Critical research studies contend that unjust power structures exist in society that privilege some people and marginalize others (e.g., racism, classism, patriarchy), and seeks to illuminate these structures to empower those oppressed by these power relations (Merriam & Tisdell, 2015); whereas, autoethnography allows a researcher to study one's own culture and oneself as a participant within that culture (Patton, 2002). Taken together, as Merriam & Tisdell (2015) summarize, a researcher applying critical autoethnography "uses data to analyze how structures of power inherent in culture inform some aspect of her or his own story" (p. 60). Thus, this inquiry is oriented in pursuit of justice and serves as an effort to teach engineering in a manner that considers and counteracts systemic exclusion of black males (i.e., race-responsive action) (Kincheloe & McLaren, 2000). A critical autoethnography of my past and present experiences as a black male who has studied, and now teaches, engineering brought voice to a perspective that is severely underrepresented in the dominant culture of engineering.

Additionally, critical autoethnography aligns with CRT's focus on using personal narrative as an interpretive structure to examine racism in society, but instead of telling the story of others or allowing them to tell their story, I would be telling my own story. Utilizing critical autoethnography materializes my desire to produce a scholarly document that moves toward more equitable teaching by elucidating the discrepancies between engineering culture and the lives of black boys that others may not be attuned to. This methodology will be used to answer the following research questions:

1. How does being a black male engineering educator offer insights about teaching engineering to black boys?
    a. How do I conceptualize engineering and its value for black boys?
    b. How do I attempt to address the gaps between black culture and engineering culture (i.e., its pedagogy and practice)?
2. In what ways does being a black male community-engaged scholar inform the way I teach engineering?
    a. What strategies and activities did I develop and implement to assist black boys' practice using engineering design and engineering thinking to address structural inequalities (i.e. racial prejudice, inadequate school resources and training)?
    b. What value (e.g., as educator, for community) is added through my regular participation in extracurricular activities (e.g., volunteerism, church) in the community of the students?

Having "successfully" navigated the educational system as a black male studying engineering, the first research question examines what insights from my experience are useful to expand the conversation around low representation of black males in engineering. I propose there is great benefit to prolonged engagement in a community one studies (Cutforth, 1997, 2000); in fact, I advocate positioning oneself in that community beyond one's direct scholarship and/or service (i.e., living there).

In this way, the maltreatment and suffering endured by disenfranchised communities are not only perceived but experienced, which provides opportunities to learn, advocate for, and teach material that connects to the daily lives of one's students. K-12 engineering education

lacks public and scholarly discussion of such circumstances, despite a growing trend of activities and curricula that are intended to be culturally relevant. This entire project is an argument for teaching with our racialized societal context in mind, as well as, authentic consideration of the community context where one practices. Some of these issues have become apparent to me during my own schooling experience, and others may arise during this research intervention. Autoethnography allowed me to shed light on my teaching process and share the adaptations I made along the way, shortcomings included.

## Critical Race Pedagogy: Teaching with Racism in Mind

The course I taught used a curriculum I designed with the intention of integrating engineering and civic education. The focus on civic education was borne out of the recognition that the civic empowerment gap—the disparity in civic and political knowledge, skills, positive attitudes, and participation between subgroups of students (based on race/ethnicity, class, immigrant status, etc.)—may be related to the academic achievement gap that is widely discussed in literature regarding the education of black students (Levinson, 2010; Rubin & Hayes, 2010; Shiller, 2013; Silverbrook & Allen, 2013). My pedagogical approach includes the belief that competence in civics can greatly improve the preparation of black youth to be 21$^{st}$ century citizens just as much as competence in reading and mathematics. The course uses CRP to correlate engineering design, engineering thinking, and civic dispositional development. The goal of the course was to teach students to leverage engineering skills for analyzing structures of sociopolitical systems that hinder their success and well-being and encouraged them to act as change-agents in developing solutions to improve the conditions of their ecological circumstance.

The course consisted of 10, two-hour long, twice-a-week meetings, and used the *Curriculum on Repurposing Engineering And Teaching Equity (C.R.E.A.T.E)* that I developed. The curriculum provides exposure to and practice engaging in the Engineering Design Process (EDP), Engineering Habits of Mind (eHOM), and *Project Citizen*. *Project Citizen* is based on a renowned curriculum from the Center for Civic Education (Calabas, CA), and is a civic education competition where teams of students identify a local problem they want to address, develop an action plan to address the problem, and then give a presentation about their plan. Though the competition component was omitted, the model of the *Project Citizen* program was executed as part of the CREATE curriculum. Engineers are described as problem solvers; the notion of solving problems is the connection through which engineering skills are transferred from a technological context to sociological context. Problems occur with technology and objects, as well as, with people and societal structures. Also, like engineering, civic problems require collaborative and complex solutions.

**Curriculum on Repurposing Engineering And Teaching Equity (C.R.E.A.T.E)**

CREATE has three modules that are interwoven throughout the curriculum in pursuit of an interdisciplinary educational experience that addresses problems of academic disengagement and civic misfortune oft experienced by black males. Engineering education, civics education, and culturally relevant teaching are merged to (a) cultivate black male intellectuals and (b) foster sociopolitical development. Understandably, these aspirational outcomes were not fully realized by the conclusion of the course, nevertheless, CREATE is designed as a seminal effort to incite the students towards such goals.

***CREATE's focus on Engineering Education***

Engineering Education research is devoted to studying how engineering is best taught, learned, and practiced; similarly, K-12 engineering education research studies engineering thinking and learning to engage all pre-college learners and impact educational systems. Alternatively, my desire is to repurpose the study of engineering education, exhorting educators to critically evaluate how to equip black boys (and other youth) with the problem-solving abilities often attributed to engineers. The National Academy of Engineering (NAE) & National Research Council (NRC) (2009) offer three guiding principles or K-12 engineering education to assist stakeholders in arranging engineering programs and activities with conceptual authenticity. The guiding principles suggest K-12 engineering education should: 1.) Emphasize engineering design, 2.) Incorporate important and developmentally appropriate mathematics, science, and technology knowledge and skills, and 3.) Promote engineering habits of mind (NAE &NRC, 2009, p. 151-152). CREATE attempts to accentuate principles 1 and 3 because students will likely be underexposed to these concepts, whereas, students' K-12 education already focuses heavily on mathematical and scientific concepts and practice. CREATE provides students the opportunity to select an area of personal interest (e.g., sports, food, entertainment) and identify a problem that can be addressed through the development of a technological solution. The students will then employ the engineering design process (EDP) to conceptualize and create their solution. This exercise takes place over multiple days allowing students to practice engineering and usually expand their understanding of engineering as they engage the discipline in ways that relate to their own hobbies and amusement.

After performing the EDP, students evaluated their use of the engineering habits of mind (eHOM) as defined in the second column of Table 2. This chart is a tool to help the students

understand eHOM in the context of engineering and transfer their comprehension of eHOM to non-engineering contexts (e.g., culinary endeavors, financial management, civic engagement). The motivation for endorsing eHOM is to train students to develop the values, attitudes, and thinking skills generally acquired through engineering problem-solving exercises, in a manner that they can apply them in problems related to societal patterns of structural inequality.

Table 2: Engineering Across Diverse Contexts Tool

| eHOM | Engineering | Basketball | Civic Engagement |
|---|---|---|---|
| ***Systems Thinking*** | Seeing interconnections, predicting outcomes | Dribbling, passing, shooting, defense, thinking (strategy) | Inferior resources, low expectations, labeling, tracking, hyper-discipline |
| ***Optimism*** | Maintaining hope, persevering through failure(s) | Turnovers, missed shots/assignments, fatigue, bad/losing games | Resilience, resistance |
| ***Creativity*** | Using imagination for novel solutions | Crossovers, slam dunks, offensive/defensive schemes | Blackness (e.g., demeanor, dress, sociality) |
| ***Ethics*** | Eliminate (or reduce) harm to people, environment | Sportsmanship | Village support, volunteerism, unified struggle/protests |
| ***Collaboration*** | Respectful, productive interaction for a unified purpose | Teamwork | |
| ***Communication*** | Learn, understand values of all parties | Play-calling, help-defense | |

### *CREATE focus on Civics Education*

In my experience, youth are aware of the social and political factors that shape their everyday lives, but usually need help deciphering the implications of the realities they recognize. Black youth perceive subtle and overt prejudices, poor youth know what is beyond their means; even so, they lack the power, infrastructure, and opportunities to alter their fate. Therefore, CREATE concentrates on developing competent and responsible citizens (Carnegie Corporation

of New York & CIRCLE, 2003). Specifically, this curriculum employs three mechanisms to breed youth civic action: (i) Discussion of meaningful, contemporary, and controversial issues; (ii) Participation in guided experiential civic learning; and (iii) Development of practical solutions to identified problems. These civic activities aim to increase students' sense of personal and political efficacy and trust.

The structure of the *Project Citizen* program authentically prepares youth to interact with public policy in a local and relevant context. Trained facilitators will serve as guest instructors to train students on basic policy literacy and research skills but CREATE can still be executed without expert trainers. The fundamentals procedures to CREATE include: 1.) students define and assess their community, 2.) students then choose and research a problem in their community, 3.) next they examine public policy related to the identified problem, 4.) they explore options for action, and 5.) the students act based on what they have gathered. Considering the students involved, feasible actions may range from presenting action plans to actual implementation of an action plan. Following this process, students reflect on their experience and what they learned. Youngsters should embrace the rights and responsibilities of citizenship whether, or not, they perform satisfactorily in school, this curriculum seeks to equip them to become change agents, particularly if their academic disengagement is a deliberate response to an inequitable schooling system.

**Culturally Relevant Teaching**

Culturally relevant teaching, as described by Ladson-Billings (1992, 1994, 1995), is the linchpin that holds together the interdisciplinary components of CREATE. This genre of teaching requires enormous intentionality considering its critical posture, emancipatory inclination, and pronounced cultural reverence. Perhaps especially when instructing black males,

social and cultural success must be equally as important as academic success. Intellectual growth, of which schooling is only a part, is the nucleus of this course. Cultural competence will be explicated, the nuances of blackness and even the tradition of its appropriation. Students will examine their racial identity and its significance, or lack thereof, to them; additionally, students will also be exposed to the civic risk of heightened expressions of black identity in America. Activities will include journal reflections prompting students to profess how they identify racially, and the things they do that indicate their cultural identification (e.g., music or food preferences, ways of speaking, etc.).

During the CREATE course, I present the profiles of black engineers, past and present, and discuss with the students the cultural capital they possess. The goal is for these black male students to see themselves, through examples, in various engineering roles and professions; moreover, they will contemplate their own conceptions of themselves without relation to other populations (e.g., whites, girls, racial/ethnic minorities). Students will be shown the statistics revealing low-representation of black males in engineering, and in college in general, and we will discuss their beliefs on why this problem has persisted so long. I will also present some common explanations for the persistence of this problem and some strategies they might consider to surmount these issues. Similarly, students will examine how the citizenship of blacks in the United States has historically been undermined and methods our community has (and continually) used to earn equal treatment under law. This includes civil disobedience and other measures of stepping outside of the law to gain what was believed to be guaranteed within the law. We will review what can be learned from these experiences that can be applied today to address identified community problems, and whether new methods of action are necessary.

Culturally relevant teaching is preoccupied with developing critical thinkers who are critical actors.

## Course Structure

The agenda of the course fluctuated constantly, sometimes I scrapped the entire planned lesson, but Table 3 displays the general agenda structure for each session. Unexpected occurrences happened frequently, things like a large number of the students being absent, or there were days when I decided, based on the flow of class, to made adjustments to the class content to connect more with comments made by students. For example, in one meeting I was using situations in basketball to help the students understand an engineering habit of mind but the discussion led to a conversation of the presence of black males in sports. Nevertheless, during my planning each lesson was organized to meet the following objectives:

1. To identify and promote connections between engineering and the daily lives of the students.
2. To encourage comfort with, and confidence in, students' racial and cultural identity, along with motivation to learn/explore other cultures.
3. To stimulate interest in communal issues and critical civic praxis.
4. To inspire scholarly ambitions.

The first segment of the class allowed the students to physically and mentally arrive, situating themselves in the physical space and preparing for scholarly engagement. This was also a time to check-in on students' well-being, previous day/week's activities, and general vibe. The next segment served as a cultural affirmation, which could include revisiting some significant topic in black history, watching a positive video, reciting and discussing a culturally significant poem, etc. Black males need regular confirmation of their inherent value to subsist in a society

that implicitly communicates they are inferior. The main lesson for the day occupied at least half of the session's time, with the potential for extended work time when it was necessary. If the day's lesson was completed comfortably, then time was allotted for dialogue concerning contemporary affairs, mainly probing the thoughts and perspectives of the students on the topic.

Table 3: Class Session Agenda

| Allotted Time (mins) | Activity |
|---|---|
| 10 | Check-in/Settle in |
| 65 | Main Lesson |
| 15 | Break |
| 30 | Hot Topic/Reflection |

**Research Site and Participants**

The students in the course are considered secondary participants in this study, since I am the primary research subject. The participants were middle-school aged (10-13yrs.) black boys living in the Greater Lafayette area. The increased academic demands during middle-school years can be difficult for any child, but are particularly critical for black boys that may already be behind in academic achievement and facing non-academic disadvantages (ETS, 2012). The course was originally designed to carry a maximum of 10 students, teaching 10 students allows for deeper engagement with the pupils while maintaining the potential of diverse student work and characteristics, but at least 15 students attended the class once or more. Convenience sampling (Patton, 2002) was used to recruit participants and they were selected as they showed interest and complete the registration process. Well, some of the students continued to invite their peers as the class progressed and as long as they could get the research documents signed I allowed them to participate. The recruitment process consisted of seeking eligible youth that participated in an after-school program I managed, along with youth that lived in the vicinity of the research site. The Hartford Hub was selected as the research site because of it was

conveniently located for the young participants and their family. This center also served numerous black males that either resided in proximity, or had transport, to the location prior to my facilitation of the course.

**The Role of the Researcher and Bias**

As the sole research subject in this study I operated as the researcher and the researched, which calls for greater depth in disclosing my positionality within this work. My passion for black male self-actualization is rooted in a combination of factors, including the history (and present condition) of my hometown, spiritual and intellectual formation experiences, and a growing affinity for black history. Acknowledging my background reveals my own accomplishments and pitfalls along my journey through engineering education, and it expounds on the influences that have contributed to my success. I do not believe the circumstantial factors in my story are unique, but I have not seen my story represented in current literature, making this work essential. I was born in Detroit, Michigan, often referred to as either the Motor City, Motown, or Murder Capital. I was raised in a single-parent middle-income household by my mother, along with my older sister. I knew my father and occasionally spent time with him throughout my childhood. I know personally the experience of living in a crime-ridden city where danger feels simultaneously ubiquitous and non-existent; likewise, the oxymoronic feeling of familial dysfunction and vigor.

Detroit Public Schools (now Detroit Public Schools Community District) are frequently characterized as unsafe, underperforming, and poorly maintained; however, as a child, this educational system was my only option for schooling. I progressed, despite these conditions, because of teachers like Ms. Pagan (1$^{st}$/2$^{nd}$ grade), Mr. Deadmon (4$^{th}$/5$^{th}$ grade), Ms. Colson (7$^{th}$ grade), and Mr. Smith (6$^{th}$-8$^{th}$ grade); some of whom I still maintain a relationship. These

teachers imposed high standards for academic achievement and character development in a way that was sincere and caring. Their harsh critique in failure was balanced with jubilant praise in success, with constant encouragement in either circumstance. I know the benefit of great teachers and the dynamic classroom environment necessary to propel marginalized students in difficult circumstances to success, but they are not enough to excel in a racialized society. I attended an all-male, private Jesuit high school because it was suggested to my mother as a more academically rigorous school compared to the other high school options. The school required an additional financial investment as compared to the public-school options, but with tuition assistance, I was able to attend. For the first time in my schooling, my racial identity was of the minority within the student population. I tolerated an immense level of social discomfort regardless of what onlookers would observe as my moderate social engagement and vibrant athletic participation. This daily social discomfort figured prominently in my decision to enroll in a Historically Black College/University (HBCU).

The tremendous confidence instilled in me by previous teachers and my village (i.e., family, community support) created an expectation within me that I would go to college, even though my high school transcript was subpar and I was negligent in completing the college application process. I was encouraged by a former teacher to explore engineering after sharing my interest in mathematics and problem-solving. I determined Mechanical Engineering (ME) would be the best fit for me after relying on Google searches to learn about engineering majors. I was rejected admission to my first-choice university, but was admitted to Tuskegee University (TU), my second choice. After defying the prudent advice to enroll in a reputable, local engineering school to avoid student loan debt, I persuaded my mother to transport me 13 hours south to Tuskegee, Alabama. My time at TU was pivotal in my evolution into a collegiate, black,

and Christian man. Each of these aspects of my identity were nourished throughout my undergraduate studies, eventually leading to interest in graduate school and a refined commitment to championing the prosperity of black youth. I went on to earn a Master's degree in ME from Michigan State University (MSU), even though I was nearly dismissed for unsatisfactory performance. With reassurance from my village and extensive introspection, I persevered, studiously adhering to life's lessons.

International travel has also expanded and strengthened my resolve to enrich the standard of life for black people struggling in America's urban ghettos. During summer 2010, I went on a Christian-service trip to Tulum, Mexico, where I assisted in the construction of a community center for rural, underserved Mayan children and villagers. I participated as an instructor in the facilitation of a technology camp for girls in another trip during the summer of 2014, that allowed me to visit Janja, Rwanda. These expeditions taught me that humanity's greatest need is for people with privilege/resources, to be willing to help people without privilege/resources. In Mexico, the people were economically disadvantaged and in Rwanda the girls were socially disadvantaged, both communities possessed marvelous ingenuity, rich cultural practices, and a desire to be politically empowered; simply, they wanted to be helped, much like black males in America.

Because of my mother's religiosity, I received a spiritual education that far outweighs my academic endeavors. While in middle school, my mother, older sister, and I changed churches and began attending Rosedale Park Baptist Church (RPBC) in the Brightmoor Community on the Westside of Detroit. This move led to my current perspective on the role of the black church in educating black children, as well as, my understanding of how one's spiritual beliefs can direct vocational endeavors. Churches are responsible for establishing moral and ethical values that

influence the way an individual performs their profession and engages society. My faith *compels* me to actively contend on behalf of BMSA. Actively working with, and on behalf of, marginalized people concerning issues of justice is core to the Christian gospel. Fortunately, RPBC demonstrated a commitment to service and residence within urban, impoverished neighborhoods. Consequently, I could witness first-hand the complex issues that work together to solidify the poor performance of black males (and females) in school, and life in general. My enrollment in Purdue University's School of Education doctoral program was a calculated quest to merge my engineering training with my devotion to the welfare of black youth. This project is the culmination of that effort.

This synopsis of meaningful events in my personal history is relevant to disclose the biases and advantages I contribute to this project. Growing up in a majority black, highly segregated city provides much insight into various experiences and cultural practices obscure to people with little-to-no experience in such spaces. Similarly, my participation in the community of black Americans across multiple regions has given me exposure to the transcendent aspects of black life. I have multi-year cross-cultural experiences that lead me to feel confident in my ability to recognize and appreciate patterns of cultural difference between other cultures and my own, with respect to values, perceptions and behaviors. Navigating both predominant and multicultural spaces has afforded me numerous opportunities to witness racial inequalities in America, leading to an increased sensibility to racism in all its forms. I have traversed many levels of the schooling system and I can acknowledge its presence at each level; however, my spiritual grounding prevents me from being cynical, though I am often discouraged. On the other hand, I have also seen what is possible when black students are culturally affirmed and able to wrestle with the prevalence of racism. My history motivated my selection of my frameworks,

concentrating on the full expression of black culture and an ecological approach to researching black males.

## Research Methods & Interpretation

### *Data Collection*

The data collection methods in autoethnographic research mirror those of general qualitative research (e.g., journaling, videotaping, interviewing), but in some cases, require creativity as I am both the researcher and the subject under study. The following section will present my data collection methods and their relation to addressing my research questions, which is summarized in Table 4. The selected research methods were chosen for their ability to capture and cohesively elucidate my metacognitive approach to teaching black boys engineering as a black man, while being mindful of inequalities in education and society.

Table 4: Data Collection Methods

| Research Question | Interviews (pre/post) | Artifacts (student work, my work) | Journaling (reflective, reflexive) | Videotaping |
|---|---|---|---|---|
| **RQ1, SQ1** | **X** | **X (mw)** | | |
| **RQ1, SQ2** | **X** | | **X (reflex)** | |
| **RQ2, SQ1** | | **X (mw, sw)** | **X (reflect)** | **X** |
| **RQ2, SQ2** | **X** | | **X (reflex)** | |

RQ = research question, SQ = sub-question

Interviews are useful for learning directly from the source what is unobservable, gaining access into one's perspective (Patton, 2002). I was interviewed by a scholar with expertise in critical race theory prior to, in the middle of, and after delivering the CREATE curriculum using the interview guide, or semi-structured, approach (Bernard, 2000; Cohen, Manion, & Morrison,

2011; Patton, 2002) and all three interviews were revisited repeatedly following the conclusion of the course. I performed two types of journaling, reflexive and reflective. When exercising reflective journaling, I focused on my practice, stating my goals and expectations for each session before it began; afterwards, I commented on the fidelity between the curriculum and my facilitation, noteworthy events, and things I considered altering for the following session. Prior to the start of this project I developed lesson plans for the first five sessions, and the remaining five were completed by the fourth-class meeting, the reflective journal entries helped me compare between the original and modified versions of the CREATE curriculum following implementation. I journaled reflectively before each lesson in anticipation of what I hoped students would learn during that session, and afterwards to note any significant occurrences or meaningful perceptions. This procedure resulted in thirty reflective journal entries. Reflexive journaling, though it included reflection, centered on myself (i.e., my thoughts, attitude) and my perceived effect on experiences within the course. I journaled reflexively once every three sessions, beginning prior to the course start, for a total of five reflexive journal entries. However, reflexive journaling also occurred occasionally following interactions outside of the course, due to my community engagement, that influenced any in-course actions.

While I have spent the past three years honing my research problem, the theme of teaching engineering to black boys in a culturally relevant manner has been consistent; as such, numerous artifacts (e.g., class assignments, my writings) exist articulating my motivation for this work and its iterations along the way. Students create artifacts (e.g., drawings) during the course which conveyed their own messages and added meaning to the responses students provide during course activities. I reviewed this data between sessions to better understand the students and adjust lesson plans when necessary to cement comprehension of concepts, and sometimes based

on student work I determined a more productive direction to assist students. The videotapes provided visual feedback to catch non-verbal data; therefore, each session was reviewed intermittently as a secondary source of data. The video recorder was placed in the rear of the course setting, and I wore a microphone to capture my instruction and dialogue with the students. While video data was not be transcribed, it was useful in evaluating students' overall engagement with the course and assessing myself.

### *Data Analysis*

The data produced from this study was analyzed through the lens of the primary research questions, with consideration of any curricular modifications completed during the study and assessments of student learning during the course. To analyze the data, I read every journal entry and listened to the interviews multiple times, taking note of the statements I read and heard that I believed were significant and resonated with me. I reviewed these statements and then began to form themes within each individual data source (each interview and journal entry). Figure 5 is an excerpt from my Teacher/Researcher journal which gives insight into my denotation process, the text highlighted green signifies statements I thought may be useful to share or may help answer one of my research questions. The text highlighted yellow are statements I thought definitely should be shared or helped to answer one of my research questions.

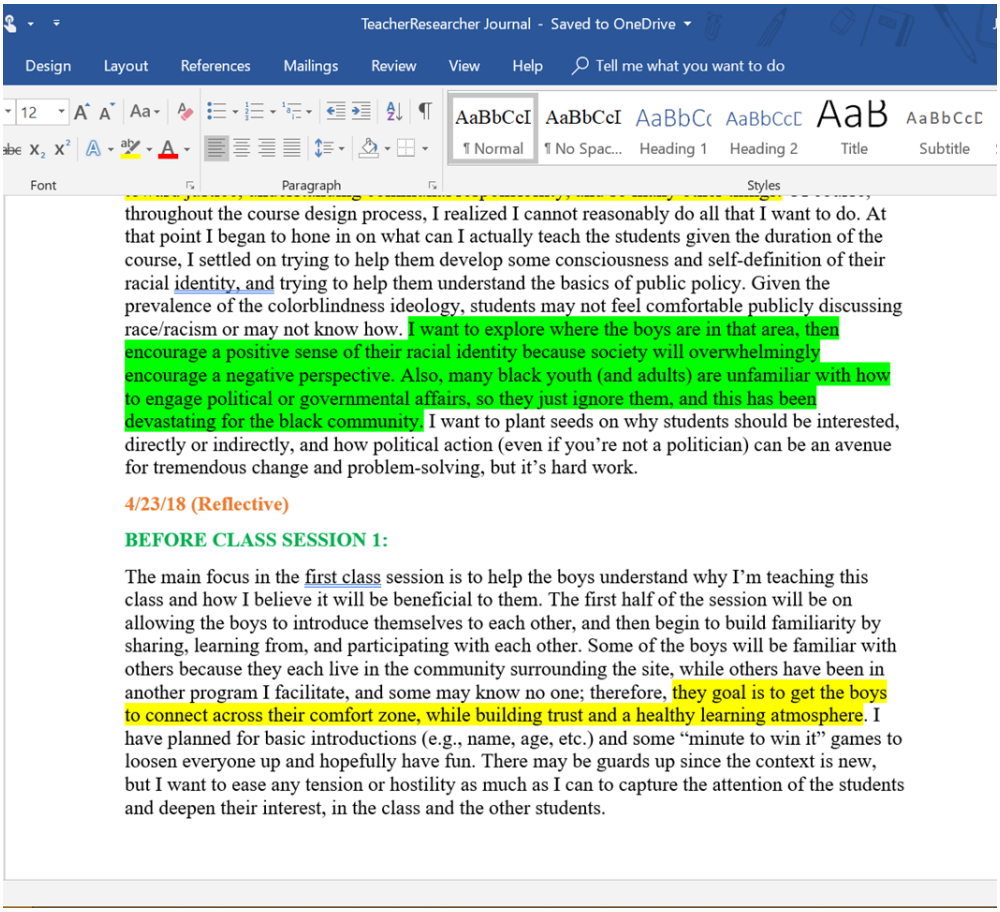


Figure 5: Excerpt from my Teacher/Researcher Journal

I examined which themes were most prevalent, then I reviewed the themes to see which best answered my research questions and could be used to construct a narrative illustrating my experience during the project. Instead of narrowing the themes to an all-encompassing list, I selected a few that I believed worked best together to provide a thorough re-telling of my experience, and then identified the passages and interview excerpts within the data that best articulated these selected themes. Figure 6 displays an example of my code list, the left-side is from my second researcher interview and the right-side is from my teacher/researcher journal entries. As I composed the narrative to chronicle my experiences during the research project I noticed two distinct narrative streams, data that related to the Academic Classroom and data that related to what I call the Community Classroom. The Academic Classroom is the learning setting

where I met with the boys and taught during the designated course hours, it was our meeting room inside the recreational center (i.e., research site). The Community Classroom was any setting where I engaged the boys, or could learn about the boys, outside of the Academic Classroom; such as, the basketball court outside the recreational center. This revelation allowed me to discuss the aspects of sociopolitical teaching that take place beyond direct-instruction and traditional school settings.

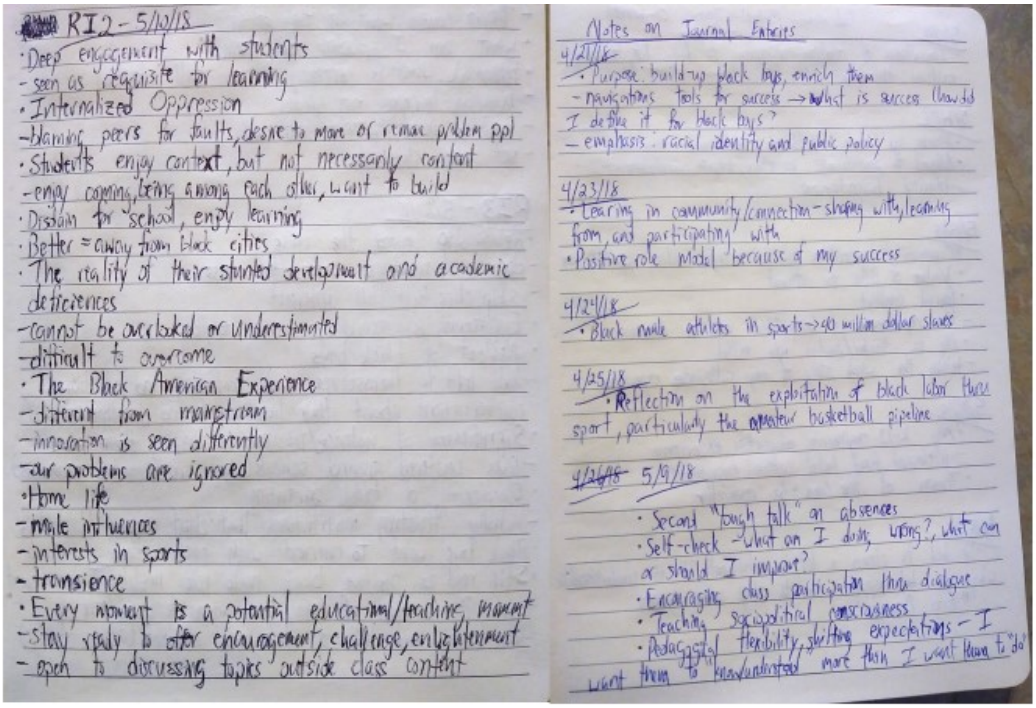


Figure 6: Coded Themes from Data

As each research question guiding this inquiry was intended to detail a different aspect of my thinking as the teacher of this course, the data collected to answer each question was analyzed separately though there may be some overlap.

1. How does being a black male engineering educator offer insights about teaching engineering to black boys?
    - How do I conceptualize engineering and its value for black boys?

I answered the first sub-question of the first main research question by examining the transcript from my interview prior to the beginning of the study, and previous class assignments and writings I have completed during my doctoral program. The interview data pinpoint my current definition of engineering, based on my educational experience and a synthesis of literature on the subject, and my previous works portrayed a picture of how that definition has changed over time. This process illuminated to what extent I place boundaries on the meaning of the field and what core elements define its practitioners. The reflections I wrote about conversations I had with the boys as well, helped my articulation of the benefits of engineering for black boys given their social and educational context. I was able to identify the shifts in my thinking of what I believe to be vital when instructing black boys and/or methods or style of teaching I now describe as necessary.

1. How does being a black male engineering educator offer insights about teaching engineering to black boys?
    - How do I attempt to address the gaps between black culture and engineering culture (i.e., its pedagogy and practice)?

The second sub-question of the first main research question was answered by reviewing the transcript of my interview prior to the start of the project and analyzing reflexive journal entries completed while I taught the course. The interview allowed me to detail my understanding of key features within black culture and engineering culture, as well as how they converge and/or diverge. The reflexive journal entries helped me decipher how these cultural understandings translate to classroom activities, and they exposed what I assumed to be true but misunderstood. Cultural considerations can include my approach to describing engineering given my audience or exercises I implement to bridge the cultural gaps I identified.

2. In what ways does being a black male community-engaged scholar inform the way I teach engineering?

- What strategies and activities did I develop and implement to assist black boys' practice using engineering design and engineering thinking to address structural inequalities (i.e., racial prejudice, inadequate school resources and training)?

I addressed the first sub-question of the second main research question by analyzing my lessons plans for each session, the student work produced during the course (which ended up being much less than I anticipated) and my own reflective journal entries as I taught the course. My lesson plans showed what type of activities and assignments I believed would be effective during the course. As I surveyed student submissions I could determine the effectiveness of class activities in moving students to achieving the objectives of the course, but I chose instead to look at their work without regard to my objectives, simply seeking to understand what they were trying to communicate with their work (this included reflecting on comments they made in class about their work). The journal entries were very helpful in disclosing the rationale for selecting various activities and my expectations on how they would benefit students' learning and making known any changes to the lesson plans and why they were performed.

2. In what ways does being a black male community-engaged scholar inform the way I teach engineering?
    - What value (e.g., as educator, for community) is added through regular extracurricular activities (e.g., volunteerism, church attendance) in the community of the students?

I answered the second sub-question of the second main research question will by reviewing the transcript of my interview after the course is completed in conjunction with the previous interviews (this topic was discussed many times), along with my reflexive journal entries throughout the course. While facilitating the course, any instances of interactions with the students outside of class time or any experience in the community that contributed to something I do in the class was recorded in my journal entries. Following the conclusion of the course I was

be able to assert the added value of acting as a researcher and educator for the community, by me being regularly present and active in the community of the students beyond the course activities.

**Ethical Considerations & Trustworthiness**

I received Institutional Review Board (IRB) approval to videotape the students during each class session, and to use their work as data. Prior to participating in the study, I ensured the parents of the participants gave their consent and that the participants themselves have provided their assent to being in the study. Each participant is de-identified and was given unique identifiers so that they can be referenced within the data. Most of the data produced through this project came from myself as the researcher and primary subject of study.

My authenticity when conducting and presenting my analysis of the data is the primary form of trustworthiness since this is an autoethnographic study. I have the responsibility of providing a credible narrative based on the evidence I gathered. I offered verisimilitude by acknowledging my own subjectivity in interpreting the data and formulating the meaning of the evidence; nonetheless, I relied on triangulation of the data and ongoing introspection to communicate the contributions of this research to the field of engineering education. Generalizability in the traditional sense is irrelevant for this study, as my experience is somewhat unique in the context of engineering due to my racial and cultural identification with the participants. Withal, readers can still evaluate the reliability of my conclusions based on the evidence I present and determine the value of my discoveries for their own practice.

# CHAPTER 4: CONTEXT IS EVERYTHING

*"Education at its best is always informal, largely unstructured and even an unsystematic process, characterized by spontaneity and closely related to the living experience and interests of both teacher and taught…Education, set aside in formal classrooms and too exclusively directed to examination success, loses its vital connection with life and degenerates into a dull spiritless routine."* – G. Howie (Aristotle on Education, p. 9)

## Trying to Escape America's Chokehold

By the time I arrived in my doctoral program, I had come to believe that black Americans have a distinct epistemological and ontological existence. When I was in a predominantly white high school, I noticed the difference in preferences between myself (and many other black students) and whites: food, music, clothing style, language, and such things. But as I got older and had more experiences around white people, absorbed more messages in media (television, film, newspaper, internet, books) and matured in my intellectual observation and analyses (i.e., social consciousness), I noticed a stark contrast in perspectives between blacks and whites. Freedom, for example, what does that *really* mean? And is that even possible for me in this life? I never got the sense that white people have had to be constantly hyper-aware of their surroundings, checking for how others around them are perceiving their movements, being careful to avoid any actions that could be interpreted as violent or hostile, making sure your hands are visible to avoid suspicion of theft, walking 10 steps behind so that the pedestrian ahead of you can remain at-ease. I mean I've never thought police officers existed to "protect and serve" me, despite growing up in a city with predominantly black officers and knowing officers that attended my church and others that are friends with my father. Even school, for white folks it seems school is to broaden one's intellectual horizon and sharpen cognitive activity; for us/me

it's "a way out" (of a ghetto), it's a better chance (not a guarantee, no matter how far you go) for economic stability. Then there is the work of disproving the myth of black inferiority, this myth took root with the development of chattel slavery and prevails to this very moment, which causes a constant state of over-performance and under-appreciation. Despite demonstrated excellence, the intellectual contributions of black theologians, doctors, inventors, historians, and so on are not revered in the same manner as their white counterparts.

Consequently, when considering citizenship in a representative democracy as a person deemed as 'black' there is a bizarre process of self-actualization we must undertake. Many have commented on this experience, but I believe one man articulated it best, W.E.B. Du Bios. Du Bois' concept of double consciousness aptly describes the experience of what it is like being black in America:

> It is a peculiar sensation, this double-consciousness, this sense of always looking at one's self through the eyes of others, of *measuring one's soul by the tape of a world that looks on in amused contempt and pity*. One ever feels his two-ness, an American, a Negro; two souls, two thoughts, *two unreconciled strivings; two warring ideals in one dark body*, whose dogged strength alone keeps it from being torn asunder. The history of the American Negro is the history of this strife—this longing to attain self-conscious manhood, to merge his double self into a better and truer self. In this merging he wishes neither of the older selves to be lost. He does not wish to Africanize America, for America has too much to teach the world and Africa. He wouldn't bleach his Negro blood in a flood of white Americanism, for he knows that Negro blood has a message for the world. He simply wishes to make it possible for a man to be both a Negro and an American *without being cursed and spit upon by his fellows, without having the doors of opportunity closed roughly in his face*." (Du Bois, 1903, p. 2-3) [italics added by me]

Sit with that. Let it marinate within. Despite Du Bois' poignant articulation, many still find it difficult (or are unwilling) to understand the depth of the burden of being black in America. I was fortunate to be alive and to be offered admission to pursue a doctoral degree, so I determined that I would investigate a way to connect the repudiation of black males in engineering with the

larger anti-black sentiment of America. I repelled the notion that the underrepresentation of black American males in engineering is due to incompetence, lack of resilience, or disinterest. This feeling based largely upon my own life experience and conversations about the shortcomings of the schooling experiences of black males was emboldened when I began reviewing literature on the historical and contemporary existence of black males in America. One book in particular resonated with me. Jawanza Kunjufu's (1983) work *Countering the Conspiracy to Destroy Black Boys* helped me to grasp the extent to which the public-school system serves as an institution of oppression for black boys, inducing trauma at an early age while contributing to a larger system of racism constantly afflicting black males over the course of our lives in myriad ways.

I wanted to manage my scholastic journey as a form of activism. I wanted to help. I wanted to alter the probability of academic success and socioemotional wellness, for myself, and other black males. I became an avid reader, seeking as many books and papers as I could review regarding the factors contributing to the black male's widespread underachievement in America (generally speaking, of course there are the highly-publicized exceptional achievers whose success is used to argue for a "post-racial" society where equality abounds), and proposed solutions for this stubborn epidemic. I cannot recall how many books, of any kind, I had read prior to my Ph.D. program, but I can say with certainty I've read more than 47 since I began my doctoral studies. I encountered many excellent resources, many of which shaped my thinking in the design of this project, and more importantly my philosophy as an educator interacting with young black minds. Moreover, I am evidence of what can occur once an intellectual curiosity is established. I started reading intensely once I discovered an intrinsic motivation, but I read other materials and genres beyond my initial scope of interest as well. After three and a half years of ruminating over how I could impact the educational experiences of black males within and

beyond engineering, I devised a multi-disciplinary approach to teaching/learning engineering. I describe this conceptualization in my first journal entry, prior to starting the research project:

*When I began determining how I wanted this course/project to be, my priority was making sure it was obvious that it is for black boys. Not just in the content and structure of the course, but in the course title I wanted it to be known who the course is for. While I was aware this would deter ineligible students from seeking participation, my primary reason for doing this was to inspire a sense of ownership and uniqueness for black boys, like "Hey this is for YOU only!" I anticipated questions on why girls or non-black boys aren't allowed, and I was eager to answer such inquiries when they arose. Honestly, I would have enjoyed including black girls, but focusing on black boys (who are characterized as performing the worst in school and life in the literature and media) allowed me to investigate deeper and more specifically. I did not necessarily set out to debunk myths or clarify misconceptions, rather, I was seeking to build-up black boys, expose and encourage them, plant seeds of knowledge. My desire was/is not to change them, but to enrich them. The systems in which they exist need change, and then their greatest potential would be more accessible, but in the meantime, I wanted to introduce tools to help them navigate current systems (e.g., school, law enforcement) successfully.*

*Success meaning staying alive (though out of their control), avoiding or reducing self-defeating behavior, establishing healthy self-identity (racial and masculine), developing political awareness, working toward justice, understanding communal responsibility, and so many other things. Of course, throughout the course design process, I realized I cannot reasonably do all that I want to do. At that point I began to hone in on what I can teach the students given the duration of the*

*course. I settled on trying to help them develop some consciousness and self-definition of their racial identity and trying to help them understand the basics of public policy. Given the prevalence of the colorblindness ideology, the students I planned to teach may not feel comfortable publicly discussing race/racism or may not know how. I want to explore where these boys are in that area, then encourage a positive sense of their racial identity because society will overwhelmingly encourage a negative perspective. Also, many black youth (and adults) are unfamiliar with how to engage political or governmental affairs, so they just ignore them, and this has been devastating for the black community. I want to plant seeds on why students should be interested, directly or indirectly, and how political action (even if you're not a politician) can be an avenue for tremendous change and problem-solving, but it's hard work.* [my teacher/researcher journal, 4/21/18]

Perhaps the most noticeable aspect of this journal entry discussing my thought process when designing the course is the omission of engineering. That was not necessarily intentional, rather I think it simply reflects my priorities for the course. Yes, though I was explaining a class I designed with engineering in its title, which I was facilitating as part of my doctoral research project in pursuit of an engineering degree, which will be an addition to my bachelor's and master's degrees in engineering, advancing the quality and quantity of engineers was/is not my top concern. However, engineering was still central to the course, operating as the connection point between the other topics I wanted to address. As I stated in my final interview, "to me [engineering] was always secondary, it's more-so a vehicle to something as opposed to the actual thing [I want the boys to grasp]" (interview transcript, 5/30/18). This meant that engineering was the means to an end, that end being teaching black boys problem-solving/critical thinking skills to successfully navigate oppressive social systems.

As I examined my first journal entry I was reminded of the research problem I aimed to address with this work, the absence of sociopolitical teaching practices in K-12 engineering education, which I argue are necessary for equitable inclusion of underrepresented racial/ethnic minorities. One sentence resonated as the primary objective of the course and my example of what sociopolitical teaching can be, "I settled on trying to help them develop some consciousness and self-definition of their racial identity and trying to help them understand the basics of public policy." I believed the boys understood they were seen as black but based on previous discussions on race with some of the boys I felt more conversation and explanation was needed to help them develop a mature understanding of race and its implications. This also meant encouraging the boys to feel comfortable talking about race, which I saw they were not, and determine for themselves how they viewed their identity in spite of external race-based presuppositions. Any child needs a healthy sense of self, but this need is magnified for black boys because they exist in a nation that manufactures an abundance of messaging implying they are inferior and defective, pre-disposed to destructive behavior and deserving of captivity and/or extinction (Alexander, 2010; Douglas, 2015; Kunjufu, 1983). I believed it was/is my responsibility as a black man to offer messages of affirmation to the boys, whether they received such encouragement at home or anywhere else. Positive statements have the power to combat disparaging declarations and inspire ingenious energy, my goal as an educator. But a high self-esteem does not redress past injustices that systematically disenfranchised black men, nor does it ensure present and future fairness regarding the material and psycho-emotional conditions facilitating the failure of black men. Thus, I thought it essential for the boys to discuss their perspective of power structures in our society and explore their civic identity.

The latter section of my first journal entry demonstrates my strong interest in discussing politics with the students in the course, which is a recent concern developed through my growing familiarity with literature on urban youth development. The works of Ginwright and James (2002); Lutkus, Weiss, Campbell, Mazzeo, and Lazer (1999); Nasir and Kirshner (2003); Youniss et al. (1997) shifted my understanding of the documented disparities in civic knowledge, dispositions, and opportunities between black youth and their white peers (notably wide when considering the sub/urban divide). Moreover, this statement by Rubin (2007) literally transformed the way I thought about the political education of black youth, it cemented in my mind the need to engage in conversations many adults think youth are unprepared to have:

> In poor, urban communities, educators will need to engage students with honesty about the disjunctures (sic) students may experience and try to provide both a forum for analyzing these disjunctures (sic) and the key skills and knowledge they will need to navigate them. (p. 474)

This statement impacted me so deeply because Rubin asserts the *need* for honest conversations with poor (in my case black) urban youth about the great disparities between what they hear, read, and experience regarding their value in this country. Before reading this statement, the most popular perspective I had encountered was that young black boys and girls could not fully comprehend the consequences of living in a ghetto, and that such information could demoralize them and cause them to think little of themselves. On the contrary, Rubin argues when educators present our sociopolitical realities truthfully, help youth analyze these realities, and then equip youth with the tools to maneuver despite these harsh realities, youth will be empowered. It is when we do not engage youth in this way that feelings of inferiority take root and fester, causing youth to disengage civically and accept political neglect and injustice. Furthermore, they begin to perpetuate self-defeating behaviors and demeaning narratives about themselves and their community. Rubin suggests such behavior makes sense for youth living in a society "*that*

*purports equality but delivers injustice*" (p. 474, italics added by me). I viewed my class as an intervention for these boys, to breakup this otherwise inevitable thought and behavior pattern.

**CHOKE HOLD** [chokehold] noun

**1:** a hold that involves strong choking pressure applied to the neck of another

**2:** absolute dominance or control

[cite Merriam-Webster online dictionary]

Teaching black boys is difficult. It's difficult because of the weight I feel trying to provide relief to a group the United States of America has in a chokehold. Paul Butler, criminal law scholar and former prosecutor, recently wrote a book entitled *Chokehold: Policing Black Men* (2018) where he articulates how law enforcement policies and practices prey on black men, and the shortcomings of current law enforcement reform efforts. The plethora of research and scholarship on the schooling experiences of black men can be composed into an anthology called *Chokehold: Educating Black Men*, as scholars have documented how schooling policies and practices prey on black males, and the shortcomings of past and current school reform efforts to cease and rectify this crisis. Teaching black boys is difficult because I have to unlearn the methods I've been taught that suppress their energetic behavior (and their intellectual freedom), I have to reject the notion that they're predisposed to misbehavior and carry a hostile/aggressive demeanor, I must counteract a deficit mentality, even as a black man, with black male friends and family who exhibit none of these negative stereotypes (Hopkins, 1997; Howard, Flennaugh, & Terry, Sr., 2012; Ladson-Billings, 1994). The messaging, dominant narrative, propaganda is just that strong. Disinformation meant to provoke fear and disdain of black men is centuries old and everchanging, this precisely, is why sociopolitical teaching is necessary in engineering, and in education in general. In my final interview I was asked to describe sociopolitical teaching:

Interviewer: When you hear the words sociopolitical teaching, what does that mean to you?

Me: Uhhh, what I think of is just in a society someone's identity based on who they are, black male/female…uhh, or whoever, how does, how do they think about themselves, and then how does society interact with them individually, as well as with their peers communally. How has [others throughout] history treated [people like them]. It's having an understanding of that, and then providing information to that group of people or that person in a way that is sensitive to that broader dynamic. (interview transcript, 5/30/18)

From this perspective, an educator cannot just teach subject matter without cultural considerations. To me this meant reflecting on my own experience learning about engineering and my presence in this community, reviewing how does the engineering community describe itself and its contribution to society, analyzing what has been the presence and quality of experience of black males in engineering in the past and what is the state of that affiliation today, investigating whether engineering can enrich the lives of black males (if so, how) and what can black males contribute to the engineering community, among other musings. For equitable inclusion of black males in the field of engineering, we as Engineering Educators cannot *just* teach engineering. We must perform sociopolitical teaching, which resulted in my class possessing three main themes: 1) racial identity, 2) politics, and 3) schooling & education from a black (male) perspective and connecting it all to engineering (and vice versa). This class was more than an effort to improve engineering interests, preparation, connections, experiences, and opportunities among underrepresented groups. This dissertation is more than an effort to transform engineering education based on scholarship and research. This research project is the culmination of a four-year journey of studying how I can be a warrior on behalf of black men and boys (and myself) fighting to loosen the chokehold on our lives. Too many black boys have been choked out of the schooling system, never able to explore whether their skills and talents could be useful to the engineering community, perhaps advancing the field. Too many young

black men have been choked out of studying engineering at the collegiate level, left scarred and dismayed, their trauma forever stained on their psyche. Too many black men have been choked out of engineering careers, told they just needed to work harder, or that they don't have the grit to be successful because the prejudice and racism they endured is 'just the way it is,' and they are left wondering were they ever good-enough. The experiences of black males in engineering is microcosmic of the experiences of black males in the United States of America, my approach to the design of this work was to prepare the black boys I taught for both.

## Teaching in the Community Classroom

*Education is that whole system of human training within and without the school house walls, which molds and develops. – W.E.B. Du Bois*

There is ongoing discussion (sometimes debate) in the black community on whether we (blacks) were better off prior to desegregation, suggesting that while integration with whites was morally admirable we only got desegregation and our community has been declining ever since. Integration differs from desegregation in that we would have been fully integrated at every level of society with value and support, it is inclusion, not merely the tolerance of one's presence (which we are still fighting for). For example, in the schooling system this would have meant providing access to white schools to black teachers, staff, and administrators in addition to black students, and providing equal resources and support to black schools to the point where one could not determine a school to be black or white (Fultz, 2004; Guinier, 2004; Ladson-Billings, 2004; Tillman, 2004). The crux of this argument is the value of black professionals residing in black communities, when de jure segregation prevailed black teachers, lawyers, technicians, etc. lived among each other including those that may have been unemployed. Whatever blacks lacked individually, they could possess collectively. In fact, in such times sayings were popular among

black Americans like, “If you want to go fast, go alone; but if you want to go far, go together” and “It takes a village to raise a child.” Now culturally appropriated and clichéd, these maxims once expressed shared values of relationship-building and collaboration in black neighborhoods, chiefly regarding rearing children. As desegregation slowly materialized, many whites left urban areas for suburban residences, and many blacks did the same. The blacks that left were largely considered middle-class and their departure caused a cultural gulf between the black middle-class and the black underclass which remains today.

One of the unintended consequences of the black middle-class exodus was the decline of the community classroom. By community classroom, I mean the informal learning that takes place between parents/adults and children, community leaders and community members, and general life experiences in the happenings of a neighborhood. Middle-class individuals are not inherently better people, but the structure of our society allows those of a higher socioeconomic status to develop a broader range of knowledge, skills, and experiences than those of a lower socioeconomic status. Individuals/families with the resources to travel and go on vacation broaden the horizons of others through sharing their experiences via storytelling or showing souvenirs, those who attend college can prepare generations behind them (in/directly), community coalitions (block club, neighborhood watch, etc.) protect and expand neighborhood resources, and so many other socialization practices take place when a socioeconomic stratum exists.

What is the value of a community member? What are the benefits, challenges of building relationships with neighbors? What happens when black people are regularly involved in each other’s lives (within the same residential context)? These are the questions I began pondering when I desired to be an educator and youth development specialist, beyond just an occasional

volunteer or mentor. I wanted to be an agent of change in my local community. As I read about history and the trajectory of the black community and black families, I noticed the black community and the black family are resilient institutions. Yet, these cornerstones for black prosperity have a powerful adversary, white supremacy, whose activists have managed to repeatedly disrupt the growth and sustenance of the black community and black family. Notwithstanding, black people have some agency in committing themselves to embracing the ongoing tradition of socially responsible individuals that intentionally devote their time, skills, knowledge, resources, and advocacy to the uplift of the broader black community and black families (starting with their local community and own family). I chose to join this legacy. Furthermore, there are those black folks who are passionate for serving the black underclass and hyper-marginalized. Hyper-marginalization is when an individual/group faces marginalization based on more than one aspect of their identity (socioeconomic status, race/ethnicity, gender), like impoverished blacks (Sims, 2018).

I was bred within the framework of what many call the Black Prophetic Tradition, where Christianity is expressed as a pursuit of the spiritual *and* physical liberation of black people. This does not mean non-blacks are considered inferior, rather as members of a uniquely oppressed people group there is a specified and intensified effort to rectify the injustices toward this group. A well-known pastor who greatly advanced this field (or tradition) is Rev. Dr. Martin Luther King, Jr. who explained in an address before prominent religious leaders of his day:

> Religion operates not only on the vertical plane but also on the horizontal. It seeks not only to integrate men with God, but to integrate men with men and each man with himself. This means, at bottom, that true religion is a two-way road. On the one hand it seeks to change the souls of men, and thereby unite them with God; on the other hand, it seeks to change the environmental conditions of men so that the soul will have a chance after it is changed. Any religion that professes to be concerned with the souls of men and is not concerned with the slums that damn them, the economic conditions that strangle them, and the social conditions that

> cripple them, is a spiritually moribund [at the point of death] religion in need of new blood. (Religious Leaders Conference, May 11, 1959)

In this statement King gives a blueprint in some sorts of what it means to Christ-like amid so much depravity and despondence upon and among blacks. And it is this very perspective that drove King to be active and effective in the community classroom. Before I was fully aware of King and developed the respect I have for him today, I witnessed and learned from many other black Christian laborers and advocates for the hyper-marginalized, they desire to see King's concept of "Beloved Community" actualized so they purposely resided in urban ghettos. They live among the neglected, under-resourced, disenfranchised, and vulnerable poverty-stricken black residents of Detroit with the purpose of leveraging their resources and networks to be of service to, and advocates, residents of destitute communities. These believers (Christians) concluded that living in the community one desires to help is the ultimate method of effectively serving and supporting other community members and local institutions. Through direct conversations I was able to gain understanding of how to differentiate between people who serve and support black communities and people who colonize and/or gentrify black communities.

Community servants have a cultural understanding of the community members they want to engage, whether they have previously resided in the same community during their youth or a community with similar cultural practices, or whether they have studied the community through conversations with community members and/or examining literature on communities with similar dynamics (demographics, resources, location, etc.). Community colonizers go into an environment thinking what they know and can do will be beneficial to any context. Community servants desire to learn about the richness of the community prior to their engagement, then co-labor with other community members to enrich areas that neighbors desire to improve. Community colonizers enter communities believing there is nothing to learn or anything

necessary to learn can be attained in a short period of time, but it's certainly not a lifelong process; moreover, they desire to have power and authority in the community without accountability to other residents and work to bring about the changes they see as necessary to the community.

I worked to cultivate the attitude and posture of a community servant during my collegiate studies by volunteering and working jobs in areas where there was a high level of need (or interest) for afterschool academic coaching of K-12 students. These experiences provided me with an abundance of great memories and relationships, but I noticed that most of the youth were black youngsters from low-income households and their educators (during and after school) often were neither of low-income status nor black. That did not necessarily surprise me, but what did shock me was how little these adults knew about the students they worked with. Moreover, the routine maltreatment of the youth was mind-blowing, mainly since the adults claimed to be the most concerned for the well-being of the kids. The cultural disconnection and abuse I witnessed was confirmed to be commonplace across America in the scholarship I reviewed concerning the educational experiences of black youth, particularly those in low-income communities. What I also discovered was that my presence and engagement with the youth outside the academic learning setting was hugely effectively in fostering positive interactions and productive activities within the learning space. I saw the youngsters at church, in the grocery store, out walking and so on, sometimes we simply greeted each other and at times we had extended conversations, occasionally participating in activities together (sitting together at an athletic event, playing basketball, etc.). Some students would invite me to their athletic competitions or performances, which provided opportunities to meet their family members, and as my own family was established (marriage) and grew (first child) they were able to meet mine.

All these events resulted from living in the same communities where I worked and volunteered or initiating a regular presence in the community of the kids by frequently visiting for various reasons.

My interactions with children outside the role of educator would be considered beyond the relationship of teacher/student, unless teacher/student reside in proximity to each other, and yet it was often the very thing that enhanced the engagement of the students. Furthermore, I noticed a psychological effect of connecting with kids outside of academic settings. I viewed the youth with a more nuanced and compassionate perspective. I was able to witness the connection between the chaotic ways some youth act in classes and the chaos they experience at home. I became capable of identifying the nonconformist behaviors exhibited in class and link that to the ways youth expressed themselves and demonstrated creativity in nonacademic activities. It became easier to reject and expunge from my psyche false messages about the aggression and insolence of black youth as I watched them be childishly naïve, guileless, and declare their ability to be a firefighter, professional basketball player, and dancer without hesitation. When I actively engage the community classroom I feel less pressure to overcompensate for any learning deficits while in the formal classroom, which lead to overload and stress for the student and myself. Indeed, I often reinforce content from the formal classroom when I engage youth in the community classroom, advancing their comprehension through multiple points of contact and responsive teaching. Additionally, the community classroom is a multidisciplinary learning context. In a very tangible way, youth can understand the connection between math and social studies as they see how many people in their under-resourced communities share their same race/ethnicity and how many in the over-resourced communities do not. When I was younger we called people who were savvy in their ability to navigate life and demonstrate resourcefulness

"street smart," and we called those who excelled in school "book smart." The irony is those who were street smart didn't do well in school, and vice versa. Pause, and think about that. I intentionally participate in the community classroom to help black youth deal with the scholastic classroom and community classroom successfully. Lastly, the community classroom serves as a space where I can be teacher and student interchangeably. The community syllabus includes lessons on parenting, contemporary culture, and insight into living in survival mode 24/7. By positioning myself as a learner in the community classroom, I grow in the humility necessary to identify my shortcomings as an educator. Students and community members feel empowered to teach the teacher, we humanize each other, and we repudiate the stigmas associated with traditional teacher/student roles so that co-laboring and transformation can take place.

Before I knew it was a concept I was embodying community-engaged scholarship, and my community involvement directly contributed to the coordination and successful execution of my dissertation research project. Community-engaged scholarship is essentially doing work that bridges the gap between researchers in academia and community-based practitioners in a way that is collaborative and mutually beneficial to the researchers and community partners involved (Cutforth, 2013). The community partners for this project were the parents and the director of the center where the course took place (i.e., research site). The site director was primarily concerned with activities that would expose the boys to new things and encourage them to perform well academically. The parents were excited about an engineering course, they wanted their boys to gain some familiarity with the profession and whatever else I could offer their sons as a positive black male role model. I wanted to promote a critical and optimistic disposition toward civic engagement and education, which is couched in the CREATE curriculum, and I wanted to study my ability to use engineering to accomplish these goals.

**Learnable Moments: The Art of Conversation**

I am familiar with the history of unethical and exploitative research performed on black individuals and communities in America; therefore, I anticipated some hesitancy from parents when I began recruiting participants for my study. I did not anticipate the in-depth conversations I had with parents that went beyond explaining the details of the project. While I intended to talk about racial identity with the boys who eventually landed in my class, I was made aware that some of their parents either felt unprepared or were simply scared to discuss this same topic with their children (though they certainly agreed racism is prevalent in our nation). Through conversations with parents I was provided insight into the complexities parents must navigate when they "escape" their high-crime hometown seeking a better environment only to land in what I consider a physically-safer yet psychologically dangerous environment, as they described their social and cultural isolation in their new city. I journaled about two discussions I had with parents that reassured my belief in the importance of my project:

*One mother I spoke with about the class shared her thoughts that black kids in this community need more black teachers, and how one of the property managers of her residence is racist. She and her children previously lived in a predominantly black city and coming to Lafayette has been an adjustment of discomfort and coping. She asked me how I planned to talk to kids about racism, and whether we should at all? I believe we certainly should because that is how they learn to maintain a healthy self-conception, build confidence to withstand unjust discriminatory and prejudicial people and circumstances, and most importantly develop a disposition toward weakening the systems that perpetuate such behavior. I had previously listened to some of her children speak about incidents they experienced involving racial prejudice in the schools they attend, and I had once before encouraged*

her to share such instances with the schools' administration and hold them accountable, but awareness by the children and awareness by the parent does not mean conversations are happening between them around race and racism. Furthermore, she (and other parents) lack any faith in the school's attitude and response to such issues. This is the context in which these boys (and *all of us* live).

Another parent spoke to me for at least 45 minutes, when I followed-up with her regarding her sons' consent/assent forms, covering topics from her dysfunctional relationship with the father of her twelve children (which she attributed to his immaturity), our sameness in being native Detroiters, her oldest son's troubles with the law, lifelong injuries she suffered as a child, and perhaps more. I appreciated her comfort and openness but was unable to fully process the extent of the information she was sharing. She had a lot of difficulties she was enduring, and that is only multiplied by each child in her care. I could sense the deep love she has for her children. She is a Muslim and lamented the lack of racial and religious community available in the Greater Lafayette area. Between these mothers, how do these circumstances impact their ability to be healthy (in terms of wholistic well-being) themselves and raise healthy black boys (and girls)? How do the boys experience these circumstances? My guess is that even if they become interested in engineering following this course, it will be very hard to sustain said interest. One thing that resonated with me that this second mother stated, was that she was glad her son was arrested and taken to jail when he was caught shoplifting. What does it mean that black mothers may be relying on law enforcement officers, who systematically have shown they have no regard for black life, and black male life in particular, to be educators and disciplinarians?!?! [my teacher/researcher journal, 4/28/18]

To add a little background, I knew the first mother I mention in this entry through her children's participation in a tutoring program I facilitated. We had interacted many times before and she had no problem giving her consent for the research project because of her trust in me. The interaction with the second mother I discussed was the first time we'd met. She, too, easily provided her consent for her sons' participation in the research project. Perhaps this was because I'm a black man, I presented myself well, the project could have a positive impact, I was operating in the community center her sons already frequented, perhaps all the above. Whatever the reasons, there was a clear interest in the course I was offering, and these conversations even gave me a feeling of guilt as I thought about the brevity of the course. The fact that the conversation occurred in the manner itself reassured me of the importance of personal interactions and trust-building with parents of black boys to the education of black boys.

As I re-read this entry time and time again, I am grieved by the first mother's recognition of the need for more black teachers. The prominent narrative is that black parents, particularly those in low-income communities like this parent, do not care about their children's education (Harris & Graham, 2007; McAdoo, 2001). And yet, she is keenly aware of the impact same-race teachers can have on her children's intellectual and emotional development, which has been long documented through research and scholarship (Egalite, Kisida, & Winters, 2015; Gershenson et al., 2017; Lindsay & Hart, 2017). What grieves me though is that she is not alone, but with the rate of black youth who never progress through the K-16 system and our nation's unfavorable sentiment toward teachers (lack of support, insufficient salaries, sayings like "those who can't do, teach") the chances of a significant increase in the presence of black teachers is slim to none. What is the cost to black youth in a society where traversing the schooling system (in some form) is a gateway to full citizenship for the non-white and non-wealthy? The relatively few

black teachers that do exist are often in schools characterized as failing, in neighborhoods characterized as unsafe. So, to go to “good” schools in “safe” neighborhoods means to get away from black people. The irony here is that presumably academically rigorous and safe schools generally are psychologically toxic (i.e., unsafe) environments for black students as they are viewed/treated as academically and morally deficient, unless they assimilate to the dominant culture. This is what Emdin (2016) refers to as symbolic violence:

> Symbolic violence refers to "the violence which is exercised upon a social agent with his or her complicity" and is not necessarily a physical violence, but a socioemotional one where one's spirit is broken as a result of the constant pressure to adhere to a structure that runs counter to one's worldview. (p. 152)

Unfortunately, this venture is common among blacks because we have been told that education [read: schooling] is the salvation mechanism we need, rather than justice.

The disorderly state of many black families leads to an over-reliance on public institutions/entities to fill-in the gaps of certain responsibilities normally performed within one’s family (biological and/or extended). No, what follows is not an argument for the dismantling of Women, Infants, and Children (WIC) and similar social programs. I am referring to activities like nurturing, life skills development, and maintenance of the family bond. These are basic needs for all children, but the second mother I mention in the journal entry is overwhelmed due to the absence of her children’s father in their home and their life in general. She receives help from her sister and elderly mother in some ways, but even that is inadequate, and she feels like she must rely on external institutions (e.g., school, police officers) to augment the lessons she emphasizes at home. In my journal I was reflecting on one of the stories she shared with me, she had told one of her sons that she’d take him shopping for new clothes while in-between a pay period. She said her son did not wait for her paycheck to arrive and decided instead to steal the clothes from a store in the mall, where he was caught and arrested. She said when she spoke with

her son about his actions he stated that despite her willingness to purchase the clothes he was aware of the family's financial situation and did not think she could afford the clothes without a big hit to her ability to manage other expenses. Nevertheless, I was dismayed at her comfort and appreciation for the arrest and jailing of her son, hoping it would serve as a disciplinary lesson for him. This anecdote gave me some insight into the complexities of parenting black boys and caused me to contemplate how I should view such situations as a teacher of black boys.

We occupy an era where police murders of black males can be witnessed at a rate like never before, not to mention the larger normality of police brutality against black citizens. This domestic terrorism at the hands of "public servants" has been ongoing since the initiation of American chattel slavery, but the amplification of its implications has become a central issue in public discourse due to the activism of groups like the #BlackLivesMatter Movement. The volatile harassment of policemen toward black males has been long documented, and even where no documents exist there are the stories of our fathers, uncles, brothers, cousins, and sons. Surely every single interaction between a black male and police officer will not end in abuse or death, but too many, and perhaps most, do. And last time I checked, those who have been imprisoned have high recidivism rates if they ever get out, so what reasons do we have to believe that any engagement with the criminal justice system that a black male has will result in remorse, reconciliation, healing, and/or future punctiliousness? It's a hard knock life for us (black people), very depressing when you feel as though you have to ask for help from the very ones causing your affliction.

During this research project many of the richest conversations I had with the boys in the class were before and after the class. I was involved with a program, the Heads Up Tutoring & Life Skills Program, for two years prior to the start of this study, and I believe those two years

best prepared me to build relationships with black youth who exist in high-stress circumstances. Most of the youth in Heads Up and the young men in my study had recently moved to the city where we met, their parents moved their family from high-crime cities in hopes of finding better employment and educational opportunities in a safer environment. These youths generally lived in low-income households and had transient residential arrangements due to their parents' economic instability. They are hyper-marginalized. When engaging hyper-marginalized black youth in an academic setting they may exhibit behaviors and tendencies that appear to suggest they do not care about learning and are hostile to authority figures. However, my experiences with the Heads Up program helped me to realize these behaviors are often symptomatic of deeper issues. Dialogue became a powerful tool to learn about the youngsters and build trust. Before each session of the Black Boys Club I would show up to the basketball court outside the research site to interact with the boys in the class and any other young men that happened to be there, I viewed these basketball court interactions as opportunities to join the community classroom.

I've played basketball for most of my life, both for leisure and organized competition, and many black boys are interested in the sport, so the court serves as an easy connection point. To an outsider it may appear impossible to have a conversation while playing basketball, but the moments before or after a game and mostly when guys are just "shooting around" that provide ample opportunity to engage in dialogues, deep and superficial alike. Youngsters are not used to their teachers participating in recreational activities with them, so this is an easy way to gain rapport with youth, regardless of your skill level, but if you're actually highly-skilled (or at least mediocre) in whatever activity/sport you join in on then your credibility with the students skyrockets instantaneously! It's kind of crazy, but true, I've won the admiration of many students

with a crossover move, jump shot, and occasional dunk. I am not advocating using one's athletic ability (or extra-curricular skillset) to manipulate or exploit the interest of youth, but it can be a powerful tool to build deep connections with young people if used properly. Sometimes even being present in the space where young people dwell, even if you just watch and do not participate, can be a strong signal to a student of your care and concern for them. I've been doing this for years and it seemed naturally effective to me, but it was not until I read Christopher Emdin's book *For White Folks Who Teach in the Hood...and the Rest of Y'all Too: Reality Pedagogy and Urban Education* (2016) that I saw this practice discussed in scholarship. Emdin explains that "to be in touch with the community, one has to enter into the physical places where the students live, and work to be invited into the emotion-laden spaces the youth inhabit" (p. 21). Emdin eloquently articulates the dynamism of this process, which he calls community-engaged teaching, and I got goosebumps reading through that section of his book (which interestingly I did not discover until after my project) because it was the very aspect of my research project that made it all worthwhile.

In the community classroom every moment is a potential teachable/learnable moment, and the more time you spend in that space the easier it becomes to identify ways to help the students develop a continuity between their learning in the academic and community classrooms. There are three statements that really get to the essence of this process, and they sort of say the same thing in different ways, so I'll place them here together:

> (1) The more deeply connected I became to the neighborhood where the kids came from, the more I began to understand the significance of context as a pedagogical tool. (p. 137)
> (2) Teaching more effectively requires embedding oneself into the contexts where the students are from, and developing weak ties with the community that will organically impact the classroom. (p. 139)

(3) During this process, it became clear that there are three basic steps to fully learning about, and engaging with, students' context. The first involves being in the same social spaces with the neoindigenous, the second is engaging with the context, and the third is making connections between the out-of-school context and classroom teaching. (p.140)

When Emdin uses the term "neoindigenous" he is describing youth of color who reside in urban contexts, generally white people who do not reside in these same spaces come into them and dictate how the nonwhite residents can move and be within their own communities. Fundamentally, in a society where *de facto* segregation is the result of *de jure* segregation, where a culture of low (low self-esteem, low self-efficacy, low socioeconomic status, low performance) is the result of historical colonialism and contemporary colonizing policies, marginalized people desire a dignifying closeness. One point of contention I have with the second statement is Emdin's suggestion of "developing weak ties to the community," because this typically leads to people extracting more from neoindigenous youth than they invest. The teacher, white or black, gains cultural competence, which leads to cultural capital, which leads to social capital, and the youth becomes another sympathy story.

The basketball court became an extension of the academic classroom I established for my research project and essentially saved the project from failing because of the high number of absences for my course. There were many instances when I would have a great conversation with one or a few of the boys before a meeting and they wouldn't come to the class (which I must say, the students began referring to our meetings this way, so I just went with it), and even cases when we'd see each other afterwards and they'd be cordial. Despite my befuddlement with this phenomenon it provided a broader framework for me to understand what it means to teach black boys. Once I was "invited into the emotion-laden spaces the youth inhabit" as Emdin describes it, I am exposed to a certain level of depth and unpredictability that educators must be prepared

for, including sometimes information that may implicate the young person's family members or other members of the community. Here's an example of a conversation I reflected on in my journal that is deeply personal and indirectly related to the boys' engagement in the classroom:

> *Before CSS [class session 5] I purposely arrived early to see if any of the boys would be outside playing basketball, and gauge whether I would have to knock on doors again to remind students about the class. Two of the boys were by the court, one noticed I had a Detroit Lions shirt on and stated that's his mom's hometown (which I knew already), I then asked them where they are from. One [the boy with the Lions' shirt] said he's from an urban city in Tennessee and the other is from Chicago. During my four years in Lafayette, I have noticed a significant number of black residents have migrated from a large urban city in Illinois, usually they cite Lafayette is safer and has better schools. I asked the boys which city they liked best and both stated Lafayette is much better than their native city, I asked why, they said it was a lot of violence where they come from and they even kill kids. As usual, I asked the boys whose fault is it that the cities are so violent, they said the people there, I asked what the solution is, they said leave, that's the only option. I asked what will happen to the people who cannot leave, they had no answer. That was not necessarily surprising, but the boy from Tennessee said his father is considering returning to Tennessee, and though earlier in the conversation he said he didn't want to go back he said he'd go back with his dad. He currently does not live with his father, and according to his mother his father doesn't want anything to do with him or his siblings. Yet, he clearly displayed a longing to be with his father, to what extent does this inconsistency [read: disconnect] impact his attitude and behavior?* [my teacher/researcher journal, 5/9/18]

I want to focus on the latter part of this journal entry, specifically on the "the boy from Tennessee." This young man is the same young man that was caught stealing from a store in the mall and arrested for a brief stint in jail. Brief refresher, he has 11 siblings, he currently lives with at least five of them and he is the second oldest child in the house, his (and his siblings') father lives within walking distance from his home but does not want to be involved with him (according to his mother), he is originally from an urban city in Tennessee which he says is a violent city that he would not want to return to, unless his father went back then he'd want to go with him. Selah, pause, and think about that. Is that not grit, to persevere in loving and pursuing someone with whom you are biologically intertwined, yet does not desire to engage you? But he does not display the same grittiness for school subjects, so his mature display of fortitude is overlooked and omitted from consideration of his actions. His blackness, specifically his black maleness, ensures he will be judged his demeanor (appearance and actions), not the state of affairs that heavily contribute to his conduct. As an educator, I cannot do anything about what he's facing, but I can listen to him. I can engage him with compassion and empathy, when he raises his hand during class and when he speaks out of turn, when I see him around the neighborhood and when I'm trying to figure why he doesn't come to class, and so on. Inserting myself into the community classroom is about more than cultural mis/alignment, it is about connecting with the daily realities of the students so that my interactions with the youth are invigorating rather than enervating.

The journal entry from 5/9/18 also demonstrates the impact of media portrayals and incomplete (or entirely false) narratives. Both boys I mentioned were aware of the troubling rates of violence in their respective hometowns, but they also both lacked a sufficient understanding of the causes and consequences of such rampant destructiveness. As a concerned citizen, this is

significant because the sheer number of people being killed on a consistent basis is appalling, especially due to the preventability of such atrocities. As a black male educator, this is significant because the impact of violence and trauma can breed emotional, cognitive, and physical malfunction, usually resulting in a nihilistic mentality. Chicago and Memphis are among the top ten cities with the most black residents and the highest homicide rates (2010 Census; Mirabile & Naas, 2018). Both cities also have a bountiful history of racism toward blacks that has shaped the current social and economic conditions of their black residents (Google "history of racism in Chicago" and "history of racism in Memphis" and take your pick). Reprehensibly, the mass media overwhelmingly publicizes the crime committed by black males in these cities but bypasses any mention of the convoluted factors that provoke nefarious behavior in the struggling communities where most of these crimes take place. Sims (2018) breaks down the manipulation of truth perpetrated by media outlets and political pundits, who construct the dominant perspective of black men held by many Americans:

> Conversation around the purported criminality and lack of educational success for Black males is decontextualized. It has become common practice to turn a blind eye to the macro-level problems that catalyze the disproportionate rates of crime in predominantly Black communities (Alexander, 2010; Miller, 2011). Instead, conversations about the innate, intrinsic pathology of poor, urban Black communities seems to be the narrative that informs much of the conversations, specifically in mass media (Alexander, 2010), around what happens in predominantly Black enclaves throughout this country. (p. 43)

This normalized fragmentation of reality allows for the marginalized and oppressed to see themselves as fully responsible for their own peril. Which is why I asked the boys 'whose fault is it that the cities are so violent?' and "what is the solution?" I was not necessarily preoccupied with assigning blame at that point but initiating a situation where I can stimulate the boys' critical thinking skills, embolden their disposition, and evoke consideration of the broader impact beyond their own individual circumstances. I want to know have they thought about how this

predicament came to be, or even what are the ramifications for society as it continues. I was not surprised to hear them propose the people doing the killing as solely responsible, nor was I shocked by their suggestion that leaving the city is the only answer, but I thought it my responsibility to plant seeds to move them beyond that determination. Otherwise, they are doomed to hopelessness.

It is very difficult teaching black boys because for many of them their despair is palpable. You can see it in their eyes, hear it in their voice, feel it in their embrace. I was fortunate, and it is precisely because I know how things could have turned out much differently that I am passionate about working to empower black boys. Part of this work is helping others understand, as best they can without experiencing it, what black males must endure to merely survive, not thrive, in America. Gene Robinson wrote an article some years ago detailing the inflammatory public discourse regarding African Americans and undocumented Hispanics in America, and he says, "there seems to be a proactive disregard for knowing or caring about their lives and plight" (Robinson, 2014). Wow, a *proactive disregard*, my goodness. I know this to be true, and it is a daily struggle trying to avoid what Cornel West terms the "nihilistic threat." And it is even more of a struggle trying to convince others to believe it *and* be willing to work toward changing it. In 1993, West described the perpetual anguish plaguing blacks:

> To talk about the depressing statistics of unemployment, infant mortality, incarceration, teenage pregnancy, and violent crime is one thing. But to face up to the monumental eclipse of hope, the unprecedented collapse of meaning, the incredible disregard for human (especially black) life and property in much of black America is something else. The liberal/conservative discussion conceals the most basic issue now facing black America: *the nihilistic threat to its very existence*. This threat is not simply a matter of relative economic deprivation and political powerlessness -- though economic well-being and political clout are requisites for meaningful black progress. It is primarily a question of speaking to the profound sense of psychological depression, personal worthlessness, and social despair so widespread in black America. (p. 19-20)

25 years later, these words ring so true they could have been written yesterday. The terrifying reality is that the urgency for remediation of the "the monumental eclipse of hope, the unprecedented collapse of meaning, the incredible disregard for human (especially black) life and property in much of black America" that West mentions is still upon us. This is why I think the "weak ties" to the community Christopher Emdin suggests are insufficient, these kids need community servants who are rooted in their community for the long-haul. I spoke with the student from Chicago I mentioned in my 5/9/18 journal entry another time that left an impression on me, leading me to journal about our exchange:

> *On the day of CS6 [class session 6], I was speaking with the newest student to the class, he came to the session which is the third time for him, he's an eighth-grade that recently moved to Lafayette from Chicago. I was asking him about his school grades and learned that he will be repeating the eighth-grade, he will soon be 14 this summer. He has multiple F's and doesn't want to repeat his current grade level, through the few interactions we have had I can tell he is not prepared (academically or socially) for high school. I asked him does he care about his grades and he said yes but could not explain any actions he took to improve them. I asked him how he was planning to celebrate his upcoming birthday and he said he might see a movie, and that he asked his aunt would she take him to the strip-club. He was serious. I asked him why did he want to go there, he said because his father and his father's friends go often.* [my teacher/researcher journal, 5/14/18]

Another benefit of my presence at the basketball court before class was the recruitment of new students. Boys from the neighborhood would ask why I was there, or when I was speaking with boys in the class they would sometimes invite other boys who happened to be at the court to the class. This journal entry from 5/14/18 details a dialogue I had with a young man I had only

seen/interacted with twice before, since he had recently migrated to the area I was curious about his adjustment to his new school and his experiences in general. During our first two interactions in the class, I could tell he was not at grade-level competency for reading and writing so I wondered about other subjects. His response stunned me. His indifference as he told me his grades indicated to me that this was a familiar circumstance for him, and unfortunately without a serious intervention he is on a path to either dropping out of school or being detained within the school system until he ages out. But that's not all, his birthday celebration request (which thankfully was rejected by his aunt) displays his need for more positive male influences. As I stated previously conversations in the community classroom are unpredictable, in one conversation the topic of discussion went from experiences living in a new city, to academic performance and preparation, to sexual responsibility and dignified relations between men and women. They don't provide instruction on that in urban teacher-education programs, yet this is the State of the (Urban) Union so to speak. And this is where the "nihilistic threat" emanates, for him, he's aware that he is in a problematic set of circumstances, but he feels powerless to do anything about them. For me, I also know the depth of his predicament, and millions of other young black men like him, and I think about all it'd take to shift their hardships into a climate of health and support, and I think about the *proactive disregard* Gene Robinson describes that is working against them, and I wonder through lost sleep and momentary depression will it actually improve. I am not pessimistic, but I am not hopeful, if that can make sense to you; that is how I can best describe my attitude concerning the well-being of black males in America.

**Habit of Mind: Community Thinking**

I have noticed over the course of my life that most of the people offering solutions to rescue black youth and families, specially the black poor, do not live among those same black

youth and families they propose solutions for, much less any vested interest in the restoration of these individuals and their communities. I advocate for residential proximity because I think it is the best way to empathize, support, and transform the plight of the poor, oppressed, and hyper-marginalized; nevertheless, it is not the only effective way. Furthermore, this is exactly what is happening in white and suburban communities, but they are considered safe and advantageous, so no advocacy is required for people to desire to reside in such spaces. Youth growing up in white and suburban communities have the benefit of being seen in a nuanced and favorable light, because they are neighbor with local police officers and their teachers, among other public authority figures. Contrary to a proactive disregard, white and suburban residents experience an assertive esteeming of their concerns and perceived difficulties. I have not yet discussed what happened during the class sessions of my research project because too often educators miss, or are unconcerned about, what happens before and after their sessions and how that context (in my opinion) is more important than what we do in the classroom. In fact, knowing and engaging the community classroom is the key to maximizing the experience within the academic classroom. This is not unique to black boys or black communities or urban spaces or people of color, it is only because teaching to the aforementioned people groups lacks such considerations that the reciprocity between the academic and community contexts must be emphasized. And that emphasis includes not just the poor decision-making of the individuals (in both contexts) but also the systemic injustice that bears down on the individuals (in both contexts). Therefore, black boys need educators that will relate to them compassionately and equitably (in both contexts).

Sociopolitical teaching is about being more concerned with context than content, while understanding that the two are inextricably intertwined. While the National Science Foundation's mission to broaden participation in engineering through "efforts to improve engineering interests,

preparation, connections, experiences, and opportunities among underrepresented groups" is important and admirable, it will continue to be unsuccessful if these efforts do not address the racism and discrimination that initiated the underrepresentation of certain people groups. Likewise, proposed initiatives must also address the complex ways racism and discriminatory practices and policies have morphed over time to maintain the overrepresentation of certain people groups and the ways all of this has damaged the field of engineering. I've never had the privilege of performing decontextualized teaching. Every professional endeavor I have been a part of whether engineering, education, or engineering education, I have had to decide whether what I do will uplift black people or further our debilitation. This is community thinking, whereby black people are my community. I aim to serve us, because people not like us don't know much about us or the facts of our existence. This prioritization of my community is less of an 'us vs. everybody/them' and more of trying to counteract being mauled into nobodiness. Sociopolitical teaching, when teaching us, understands the complicated nature of this, and the importance of community connections when instructing us. Consequently, the traditional learning environment is seen not only as unproductive, but as counterproductive. Classroom culture is transformed, students engage in community, instead of in competition, meaning pupils are encouraged to use their diversified skillsets to complement and strengthen each other rather than seeking to maintain advantages. With the Black Boys Club, I tried to enact a classroom experience that accentuates community, black male community.

# CHAPTER 5: SOCIOTRANSFORMATIVE K-12 ENGINEERING EDUCATION

*Malcolm X was a good example of what might be called the black leadership dilemma. That is, during the early 1960s, his trenchant and highly articulate condemnation of white racism gained him tremendous support among poor blacks but harsh hostility from most of white society. He didn't want, as many whites feared, to lead a revolution, but was trying through his angry tirades to show blacks that racism, not inherent inferiority, was the source of their self-hate and self-destructive behavior. What Malcolm X hoped to bring about was the decolonization of the black mind--the awakening of a proud, bold, impolite new consciousness of color and everything that color means in white America.* (Bell, 1987, p. 222)

## For My People

I'm **black** and I'm **proud** (to be black). My melanin aesthetic colors everything that I do. And as long as anti-blackness dominates our nation's culture, there will be a need for colorized consciousness and responsibility. I will say the role of a black citizen in public life is to have a healthy perspective of one's own identity and potential, and to engage the well-being of all individuals with a competent understanding that blacks rank last in terms of social power in the United States of America. Thus, a concerted effort must be leveraged to restore the health of the black community (involving more than just black individuals). Blacks must utilize their particular skills and talents to uplift their community through diverse avenues, while also educating non-blacks on racism and its impacts and emboldening these enlightened individuals to join the fight for *true* democracy. Regardless of how people feel about Malcolm X that was his aim, and Derrick Bell (1987) characterizes Malcolm's efforts as seeking the "decolonization of the black mind." This is hard work, and lifelong work, and it can take many forms. Malcolm X was an exceptional orator and leader, so he used his gifts toward decolonization of the black

mind. I am an educator, and I teach hoping to do the same, that is decolonize the black mind. But what is Decolonization? Ekemini Uwan, in a blog post on what she calls Decolonized Discipleship, proclaims:

> decolonization involves two aspects at work simultaneously: the first is decolonization of the mind, which starts by calling the colonial situation into question. The second aspect is when the natives actively turn the colonial structure on its head, so that the once colonized natives gain their independence. (February, 2018)

This concurrent process for the black mind means acknowledging and deconstructing Eurocentric ways of knowing and being, while affirming and promoting Afrocentric ways of knowing and being. Both are imperfect, but blacks need a paradigm that is humanizing and intellectually emancipatory, providing a comprehensive account of our ancestry and contribution to mankind. Decolonization is an intentional and self-reflective process, requiring discernment, wisdom, and courage. I aspire to facilitate decolonizing educational experiences, and I operated my class during this research project as a space to explore what this looks like practically.

I understand that whatever I perceive to be best for the black community may not be in agreement with the perspectives of other black Americans. Even where there may be agreement in *what* needs to be done, there can be great disagreement in *how* it should be done. Furthermore, I readily admit that my subjectivity permeates my teaching. Sadly, many others believe their teaching (or general work) is objective and would view my purposeful attempts to decolonize black minds as bias-laden indoctrination. I reject this notion and contend that my forthright subjectivity and emotionality allow for a more humane teacher/student relationship in the learning process. Although I may have a certain perspective, I aim to actualize what Margaret Mead (1961) suggests, “children should be taught how to think not what to think” (p. 246). I noticed many instances in class when I took opportunities to encourage the boys to think

critically, oftentimes oscillating between class content and topics related to being a black male. Take for instance this reflection on the first day of class:

> Once we got rolling, I did a welcome and we began brief introductions (name, grade, hobbies, and career goals), and I was surprised but not really at what was shared that has occurred very often in my experience and is present in literature on black boys as well. The majority of the boys desire to be professional athletes, about 8-9 desire to football players and about 2-3 desire to be basketball players…Personally, I don't want to be a dream-killer, but I attempt to creatively persuade boys to consider different careers, or at least alternative roles within athletic careers, because sports have not been helpful to the holistic development of black males or the black community. There's a book entitled *Forty Million Dollar Slaves* that aptly articulates the ways the presence of black males has dominated the sports domain, but the culture of sports has dominated them. Black males are overwhelmingly represented in the most physically demanding positions [in football], those [stigmatized as requiring] less intelligence, and they gain the least given the amount of sacrifice and investment into the sport they play. Professional black male athletes would typically come from low-income households/communities and would not receive training on financial management so many would squander their earnings, having tremendous fame but no money to live on, though that has somewhat diminished. Beyond the physical damage, there is the control of black male minds and behavior, here is the most damaging aspect. Political action, or advocacy for justice on behalf of blacks, is seen as a threat to their jobs status as they can be prejudicially "cut" from their teams without just cause or repercussion, with no other skills to rely on they have to protect their position at all costs, even if their very involvement in the sport is counterproductive to their greater well-being. I hope for

*something much better to be achieved and engaged by black boys (and girls).* [my teacher/researcher journal, 4/24/18]

I was not given the chance to dream about a career as a professional athlete. Early on in my life I was dissuaded as I was informed of the low probability of that actually happening; moreover, I wanted to be a good basketball player but wasn't as interested as investing the amount of time and effort required to be outstanding. However, all throughout my life I watched other black males vocalize their dreams of being a professional basketball or football player (or both), and I've subsequently watched some adults tell the boy(s) the slim chance they have at accomplishing that goal. But what is probability to a young black boy who only (or mostly) sees rich, famous, and seemingly happy black men on television representing some athletic organization. Many of these same boys live in single-parent homes with their mothers, observing her struggles and sacrifices, and they want to 'rescue' her when they reach adulthood by buying her a nice car, and a nice house in a nice neighborhood. Mychal Denzel Smith, a contributing writer at The Nation, calls the disproportionate number of black men in football a "lottery ticket" for black men as they are seeking answers to "debilitating poverty" (January, 2013). With all this in mind, I solicit the thoughts of the boys on why black men make up over 70% of the National Football League despite being only 6% of the nation's population, or why do they believe Colin Kaepernick (NFL), Eric Reid (NFL), Craig Hodges (NBA), and Mahmoud Abdul Ruaf (NBA) were blackballed from their respective leagues after protesting our government's tyrannical treatment of blacks. We discuss the physical risks of professional athletics and the exploitation of youth during amateurism, especially at the collegiate level. The boys are already familiar with what they perceive to be good about sports, I offer an atmosphere to have candid conversations about the less-popularized aspects of life in sports. In a traditional classroom these career

aspirations mentioned by the boys probably would be overlooked or taken simply as boys being boys, but as a black man teaching black boys I saw this as a critical opportunity to insert my sociocultural understanding to broaden the horizons of the boys. Often boys have not thought through how to become a professional athlete, it's just what they enjoy (to some extent), all they know about, and/or primarily where they see famous and economically successful black men. Educators of black boys must understand this and become able to skillfully shift the attention of black boys, challenge them to consider other skills/talents/interests they have, encourage them to have vision beyond what they see now, train them to have the courage to step into places/experiences they have not had before.

On the first day of my class I gave the boys notebooks for their own notes and to write their responses to various prompts I planned to provide throughout the course. I asked the boys to place their name (or nickname) on the notebooks and one student wrote "I hate school." This occurred after we discussed the schooling experiences of the boys and their favorite school subjects, if any. I appreciated the honesty of this young man and it helped me realize very quickly the need to disassociate schooling from education/learning, and the sensitivity I would need to exercise during this course when discussing school with the boys. The irony of this one student pronouncing his disdain for school is that he showed the most potential for having any inclination toward engineering, as a middle-schooler. His mother told me about how he gathers random objects he finds around the neighborhood and tries to deconstruct or reconstruct them. She shared that she often chides him for tinkering with objects in their house, in fact, he was working on restoring a broken go-kart with a friend while his mother and I was having this conversation. He would appear to be the prototypical pre-college engineering prospect, except he loathes the very avenue that would get him there. This young man is one of the younger brothers

of the youngster I've already discussed who was arrested for shoplifting at the mall, both are sons of the mother with 12 children whose father is absent. Private school is not an option, and neither is home-schooling. This scenario nicely depicts the limitations of K-12 engineering education initiatives that do not address issues within the larger schooling system that disenfranchises the students these initiatives desire to reach and recruit. K-12 engineering education lives within a larger context of schooling and schools have a history of marginalizing black boys; therefore, K-12 engineering teaching that does not directly challenge the status quo will only ensure the ongoing underrepresentation of black males in engineering.

My goal is to develop lifelong learners, so I sought to instill the concept of Black Male Scholar Identity, which is a modified version of Gilman W. Whiting's (2006) Scholar Identity model. Whiting lists characteristics he believes constructs a scholarly identity for "culturally diverse" males, also his model is promoted as being useful for educators working with "gifted" male students. I believe Whiting highlights some important characteristics, but I think they should be instilled in *all* students, and since I'm working with black boys in my course I contextualized some of the characteristics to their specific identity. Imagine what the education field would be like if we treated *all* students like they are gifted! I can't control what other educators do, but I treat black male students like "gifted" students, because they are, unfortunately their giftedness is suppressed and/or ignored. In my course, treating black boys as gifted learners meant that I maintained a positive attitude regarding the intellectual potential of the boys, which led to high expectations for the growth and performance of the boys. I used technical and complex terms (with definitions) at times during the course to help the boys become familiar with the language of engineering. Advanced students tend to have a heightened interest in extra-curricular learning opportunities to deeper their understanding, so I shared

multiple learning opportunities to learn about engineering beyond the research project. These opportunities included the Summer Engineering Workshop (SEW) offered by Purdue's Minority Engineering Program, and the Engineering track offered by my Research Advisor during the Purdue Athletes Life Success (PALS) program at Purdue. Gifted students are also usually capable of completing long-term projects that promote some level of independent study and are more complex than classroom content. The preset duration of the project did not allow for a long-term project, but I often encouraged the boys to complete various tasks in their community to learn more about their community members, services, and institutions which I believed would help them identify problems and brainstorm solutions for their civic problem-solving project assigned toward the latter portion of the class. Table 5 displays Whiting's model and my modified version, which I introduced to the students.

Table 5: Comparison between Scholar Identity and Black Male Scholar Identity Models

| Version | Whiting (2006) | | Holly, Jr. (2018) | |
|---|---|---|---|---|
| Characteristics | • Self-Efficacy<br>• Willingness to Make Sacrifices<br>• Aspirations<br>• Internal Locus of Control<br>• Self-Awareness | • Strong Need for Achievement<br>• Academic Self-Confidence<br>• Masculinity<br>• Racial Identity and Pride | • Self-efficacy and Self-awareness<br>• Willing to make sacrifices<br>• Maintain aspirations | • Healthy masculinity<br>• Racial pride and confidence |

*Of course, Whiting has much more work and research experience than myself and that informed his model, but I wanted to introduce these concepts to the students and present them in a way that is sensitive to the complex nuances they experience as black males in America. For example, having an internal locus of control has been shown as beneficial in literature, though it is lacking in impoverished citizens and people of*

*color; however, I have not seen much in-depth exploration of what sociohistorical circumstances contribute to that mentality. It is easy to encourage people to believe they have control over their lives, but hard to have such a belief when you watch people with your own identity (black, male) get killed by police and civilians without punishment or conviction (moral or legal). When the data shows that no matter how much schooling black Americans get, they only improve in comparison to other blacks, moving no closer to the wealth, health, housing, or employment status of whites (especially) or other people of color with fewer academic degrees and much less schooling. You can be black and rich, and still get treated like a peasant. You can be black and be President of the United States, and still get treated like you don't belong here (in the U.S.). To be black in America is to always question whether you fully control your own life. In another sense, black boys know that they are black, but they are trained to think that is a bad thing, and that they are less capable because of it. So, pride is great and they can feel good about themselves, but they also need the confidence to do good with themselves. They could go through their entire lives expressing pride in their racial identity and yet never fully asserting or expressing themselves in academic or social settings, I've seen it. I wanted to plant a seed in the boys' mind that learning is good for their own prosperity, and it is not limited to schooling. Education is broad and essential, schooling ≠ education.* [my teacher/researcher journal, 4/30/18]

Based on research regarding black boys and my own identity formation process, I felt some modifications were necessary to Whiting's (2006). I believe self-efficacy (belief in one's own ability to do something) and self-awareness (understanding of one's strengths and weaknesses) work together, when black boys are aware of the tremendous resilience they have, can acknowledge their skills and talents, and understand that their weaknesses are not definite

and can be improved upon, black boys have an improved self-efficacy. As I reflected on my life, I noticed I began to increase my self-efficacy when I started examining my abilities for myself, instead of relying on other's perceptions of me or media messages about black males. I added 'maintain' to the aspirations characteristic because black boys in their formative years aspire for greatness just like any other child, but as they navigate the *conspiracy to destroy black boys* (Kunjufu, 1983) it becomes very hard to preserve any ambition for success. I dropped the internal locus of control characteristic because schools are not safe/neutral places for black boys, they are criminalized and pushed-out which undoubtedly affects their academic engagement and performance (Ferguson, 2001). For black boys, the village (i.e., community support) is key! The village can often mitigate the consequences of living in an unjust society, where "doing the right thing" or "working hard" is not enough to guarantee success. I eliminated the strong need for achievement characteristic because Whiting (2006) description places social interaction and academic achievement in a false contrast, he explains for those with this characteristic "the need for achievement is stronger than the need for affiliation" (p. 49). Particularly for black males, achievement and affiliation are intertwined, especially at the collegiate level where their academic and social isolation have been major factors contributing to high rates of attrition (Strayhorn et al., 2013). Again, black boys *need* community, and if they desire to be popular that does not mean they cannot be academically successful as well. I removed the academic self-confidence trait because Whiting's definition mentions these learners feel comfortable and confident in academic settings (I've discussed many times why this is often not the cause for black boys at no fault of their own) and they do not feel the need to minimize their academic abilities and skills; unfortunately, this latter dilemma is exactly what many black boys feel they

need to do to. bell hooks (2003) poignantly explains the intellectual imprisonment black males must grapple with as she writes:

> Whether in an actual prison or not, practically every black male in the United States has been forced at some point in his life to hold back the self he wants to express, to repress and contain for fear of being attacked, slaughtered, destroyed. Black males often exist in a prison of the mind unable to find their way out. In patriarchal culture, all males learn a role that restricts and confines. When race and class enter the picture, along with patriarchy, then black males endure the worst impositions of gendered masculine patriarchal identity. (p. ix-x)

The holding back referenced in this statement can manifest in various ways, one for black boys is not fully demonstrating their intellectual capabilities for fear of being considered white in a context where intelligence is seen as synonymous with whiteness (i.e., counter to blackness) (Fordham & Ogbu, 1986). This deplorable phenomenon is the result of centuries-long demeaning of black intellect, it is misguided but it is real.

I modified the attribute concerning race to be racial pride and confidence because I believed establishing one's racial identity is a prerequisite to establishing a sense of racial pride so it could be omitted, however, a sense of racial pride does not necessary guarantee one will have racial confidence. By racial confidence I mean that one is not confident *in spite of* being black, or confident and just happen to be black, rather, one is confident *because* he (or she) is black. One can gain confidence from a number of factors, but I believe black boys should develop pride in their racial identification and leverage that as a source of their belief and self-assurance in their qualities and abilities. Specifically, I am referring to the black cultural values, beliefs, and practices that empower black boys to excel. Lastly, I added 'healthy' to the masculinity characteristic because of my belief that many black boys lack healthy male role models. There are diverse ways to display what I consider to be healthy masculinity, but for this course I was expressly interested in discussing the bravado some black boys think define

manhood. Far too many media representations of black men portray them as hyper-aggressive, boastful, having no regard for authority (Kitwana, 2008; Page, 1997). I wanted to hep the boys think about these characterizations and how they may or may not be reflected in their own behavior, we discussed ways to manage peer-pressure to engage in such behavior, and practical alternatives to formulate conceptions of ourselves beyond physicality. I wanted to help the boys gain a nuanced understanding of the agency we have in the midst of oppressive conditions.

I developed agency in my learning somewhat recently, it was a gradual process that began during my time at Tuskegee University. There was a point where I became interested in (deep) learning for my own knowledge development and critical thinking, as opposed to (temporary) learning for good grades and social approval. My out-of-school time was spent differently, shifting from doing the minimum to find "the answer" to problems to studying more than teachers assigned, wrestling with problems/subject matter, and formulating my own ideas. Eventually, I grew the confidence to verbalize what I was thinking/learning during my classes, but I still struggle to do this because institutions of higher-education are not the intellectually inclusive places the claim to be. For this reason, I want to help black boys cultivate an intellectual independence much sooner in their lives.

In addition to the formulation of a Black Male Scholar Identity, I wanted the boys to establish a healthy raciogender (a word I thought I created but have seen others use, though not yet popularized, that combines consideration of racial and gender factors) identity, a Black Male Racial Identity. A healthy raciogender identity is necessary for hyper-marginalized people groups to ward off internalized oppression. Internalized oppression can be described as the process whereby people that have been exploited, discriminated against, and generally maltreated steadily over time "internalize (believe and make part of their self-image–their

internal view of themselves) the myths and misinformation that society communicates to them about their group" (Axner, n.d.). Internalized oppression is a disheartening sensation in itself, but it is the consequence of this feeling that is most detrimental. Individuals become toxic to themselves and their community (others who identify similarly), their self-esteem is damaged, and their psyche is constrained, all the while contributing to self-destructive behavior and spreading the myths and misinformation society communicates about their group. I believe this is why Malcolm X and many others like him were/are so adamant in preaching self-love and counternarratives to black people, because lies about black inferiority are erroneous for sure but when you witness the damage done to and by black people who accept these lies it is devastating. If a campaign for promoting the myth of black inferiority has been ongoing for 399 years, it wouldn't be surprising if young black men (most likely unknowingly) express such mythical ideas, right? This is exactly why I ask people who fault is it that black people are experiencing and doing the things that they do, it is less about naming blame and acts as a brief toxicity test, measuring the toxicity of their thinking. So, I was not surprised when toxic thinking showed up in my class, that's why I do what I do, acting as a black male mental safety expert removing toxins to allow for safe thinking. This lethal thinking appeared multiple times throughout the course, and it started early as I share in the following journal entry:

*In the second class session, we did a review of the reasons why the class/club is for black boys only, why we're focusing on Engineering, and what other things we will discuss. During our conversation on what research says about black boys, some of the boys spoke about black boys not caring about school and not asking for help as reasons why black boys fail. I mentioned these reasons are blaming black boys (BBs) themselves, and asked what other factors contribute to the difficulties they experience, but I thought it interesting that the first reasons the*

*boys gave were placing the fault with boys and their attitudes. Perhaps this is what they hear from their teachers, or parents, and they too think our success is determined by our own decision-making. Such perspectives can be dangerous as they grow older and begin to look at the outcomes of their peers and even themselves, lacking a complex or systemic analysis can lead to prevailing victim-blaming. Pushed a little further, one student said some BBs are not "in the right school district or don't have the right tools." This again showed me that the boys have awareness or broader and bigger issues that contribute to their poor performance and experiences, but need space and a little prodding to articulate these things, which causes me to think if these discussions happened more often they could be better prepared to address these issues and achieve success, or even if they do succeed still, they could have a healthier understanding of why others may not.* [my teacher/researcher journal, 4/30/18]

I want the boys to know that our success (however that may be defined), and even our survival, in this country does not simply depend on our ability to make the "right" decision. On the one hand, the privileges attributed to whiteness, wealth status, and such traits provide exoneration for full responsibility of "poor" decision-making and amplified benefits for "good" choices. On the other hand, the disadvantage and indecency attributed to blackness, poverty, and such traits incite mercilessness for "poor" decision-making and meager reward for doing the "right" thing. Important to note here that what is understood as "good" or "bad" decisions are determined by those in authority because of their whiteness and wealth. For black people, there is a complex relationship between structural racism and individual agency that I have yet to fully understand. Notwithstanding, the overemphasis on individual decision-making for blacks is an age-old scheme to portray our community as morally-deficient and justify the maltreatment of blacks in this country. Thus, when the boys demonstrated this line of thinking I challenged them

to think further, think deeper. We spent a lot of class time in dialogue so that the students could get practice sharing their thoughts and unpacking how they arrived at certain conclusions. I realized that the boys do not talk about these issues much, though they experience them daily, which leads them to believing and accepting that their circumstances are "just the way it is" as opposed to seeing their circumstances as the result of decisions made by past and present actors (government officials, parents, community members, etc.). Simply talking about the daily realities the boys navigate does not change their situation, but it can alter their disposition about what they are experiencing. With the time I had I sought to encourage their concern and awareness about what their black maleness means for their existence, the opportunities they will or will not have, the antipathy they must endure, and dispel the myth of their powerlessness in challenging it all.

## Revolutionary Engineering Education

> *More often, diversity is associated with an increased labor pool or access to a variety of problem-solving approaches, somehow embodied in women or people of color as groups thought likely to enhance America's global technical performance. On a deeper level, the pursuit of a diversified workforce may hold more portentous meaning, skewing social interventions into academic science and engineering toward those programs that maintain existing opportunity structures, even while admitting increasing numbers of minority citizens into technical occupations.* (Slaton, 2010, p. 204)

When I tell people I have a bachelor's degree, and master's degree, and am currently pursuing a doctoral degree in engineering I guess there is some assumption that I love engineering. I understand the presumption, but my story is more complex than that. In fact, I am at a point now where there's not much about the field of engineering that I like beyond its ability to develop analytical and systems thinking skills, regarding technological systems. I entered my

undergraduate studies with little familiarity with the field, while still going through a maturing my own self-identity, and the longer I stayed within the engineering education pipeline the more I realized my whole self and other black males like myself were not welcomed…unless our entry enhanced some superficial diversity initiative. My assessment is not true of every individual within the engineering community, but I believe it represents the culture of the field, which means people who express delight in my presence and contribution to the field can also do and say things that makes my presence difficult and prevents other black males from occupying engineering spaces. The scheme to maintain oppressive structures while claiming otherwise is real, and its purveyors are savvier than ever before. Amy Slaton (2010) referenced the "portentous" pursuit of a diversified workforce, which usually connotes desiring more ethnic/racial minorities and sometimes includes women. In a nation where Affirmative Action is thought to be a program that lowers standards to allow for the admission of more blacks, but in reality, white women are both its greatest beneficiaries and detractors, specificity is key. I digress, but some may wonder if I feel this way then why do I stay? Great question. Simple answer: I have flunked out. I came close, but almost doesn't count, so I resolved to go as far as I was allowed so that I could share my experience with, answers questions for, and even warn young black males (and females) that express interest in engineering. I don't believe all of engineering and its culture is bad, but I do believe unless a revolution occurs it will continue to be bad for us overall.

I did not necessarily see this project/class as starting or continuing the revolutionization of engineering, but I did this project and am sharing what happened to assist others in the engineering community think about practical ways of teaching engineering in a liberative way. Still, engineering educators must be concerned about more than emancipatory teaching, what

good is intellectual freedom within engineering if when I am in non-engineering contexts I am mentally and emotionally enslaved. So, the way I taught engineering was about something much bigger than, but directly tied to, engineering. And that is how I believe engineering culture and practice will truly be transformed, the impetus has to be about more than the increase in quantity and quality of engineers, tokenizing ethnic/racial minorities to appear inclusive, or seeking diverse perspectives to advance global technological competitiveness. The following is a transcript excerpt from an interview during the project where I discuss how I used engineering to address a broader issue:

> Me: The value of the class...helping them see that [race matters], help them to think about that was significant to me. And that's why the engineering, you know, is a vehicle to see like 'ok, I'm going to show you all black male engineers, and you probably never seen this before. And you don't know them, and you may not remember what I say about them, but you can't say that you didn't see them.' But, again that's building, for me, it's building on the significance of racial identity, as opposed to building up engineering.
> .
> .
> .
> Me: So, race kinda transcends all these other things that show you like, ok you can learn about that thing, but for me in this context the important thing was recognizing that you matter and your identity matters. You will face a lot of difficulties, but that doesn't have to be a complete barrier. It will hinder you, it will cause psychological difficulty, but it doesn't have to be the determinant of your life success. So, I feel like in that way talking about certain things, even though they are problematic, for me, I can try to flip it. But I think there is a responsibility as a community to help me flip it...I have to be skilled and clever in a way, where I use the momentum and access [being provided to black youth] to help them take that and see it, but in a broader context. (interview transcript, 5/30/18)

This excerpt directly and indirectly describes the first lesson I did with the boys that began to focus on introducing the students to engineering, what it means to be an engineer, and give them practice doing engineering. Obviously, in teaching an engineering course this lesson needs to happen, but I tried to structure the class in a way where the definition of engineering is broadened. Therefore, it was not just robotics and buildings, or LEGO™ building, or anything

traditionally associated with engineering that may not be relevant for many people, but especially black boys. The emphasis instead was designing, using science, making/doing things, and being socially engaged. I believed presenting engineering in this way does not change the core of what engineering is but makes it more accessible for the students, they demonstrate these skills already, I just need to help them think through how and when they demonstrate them, and then they can associate themselves with engineers and engineering. Part of the process of helping them identify with engineering is to show them black male engineers, who are diverse themselves, and work in diverse fields. Also, part of the process is breaking down stereotypes of what engineers look like, showing black engineers helps do that, and showing engineers that look like normal people. In my experience, many people think of engineers as nerdy white men that love math and science, some people think they mainly work on cars, or even trains. When you Google images of an engineer you get white men with hard hats and blueprints, and that dominates the images for multiples pages. I didn't check if the students held these same misconceptions, but I wanted to show them black men who don't look nerdy and do more than work on cars in engineering from the start of discussing engineering. I did an activity where the students looked at pictures of black men and guessed which of the men are engineers, and I try to get them to think about what caused them to choose certain men. At one point many people thought of engineers as nerdy looking people with glasses and short-sleeve button-down shirts, now students may be less familiar with who engineers are and what they look like, so I want to present positive racialized imaging. Yet, this is about more than engineering, so I strategically chose the men to have a wide range of characteristics. Not all the engineers have a college degree, some are extremely famous, some work directly in the engineering field and other in a variety of career sectors, and so on. I highlighted the college degrees that the men had to show

them that being successful in school is most helpful in becoming an engineer, but learning and intellectual curiosity is most important, as I showed one person that didn't have a college degree. I wanted to students to understand college is the most popular way, but it is not required, it is not the *only* way, because many educators engage black youth and males as if it is the only way. This may seem contradictory to informing them about the low representation of black males in engineering, but I do not want to make it seem as if it is their responsibility to increase that number, more so I wanted them to think about why is that number so low. Do black males not like engineering? Are they incapable of making it through? Or is something else causing their underrepresentation? I think it is a complex issue, but the majority of fault is outside the control of black males themselves. Nevertheless, seeing black male engineers can be helpful in cultivating racial pride and confidence, and maintaining aspirations.

To assist their identification with engineering we did an activity called "Make An Engineer," where students designed their own engineering figurine, based on their interests and skills (i.e., intrinsic motivation). Before students can authentically decide on whether they want to pursue some career they must first believe the career pathway is achievable. People may not directly say that black males can't be engineers, or they may, but without seeing such representations or engaging the content, the boys can simply believe that to be the case. Said differently, the more they engage with the field, the easier it'll be for them to identify with the field. Which also brings up the responsibility I have, to address the barriers these black boys may face should they desire to pursue engineering. I believe this lesson is relevant and meaningful for the students because hopefully it will expand their conception of possible careers as a black male, they probably have not seen engineers in-person, so the exposure at least plants an initial seed of who can be an engineer and the diverse ways they can work in the field. Also, this

activity sets the context for which we will explore problem-solving and it can be empowering to see that they can perform engineering skills, even if they don't want to be a professional engineer.

I guess since I talked about cultivating a Black Male Scholar Identity and a Black Male Racial Identity, the engineering component of the course should be called developing a Black Male Engineering Identity (of course, none of this is about defining what those should be, they are just how I perceive them). These lessons featured an amalgamation of topics including, the characteristics of a "good" (read: ideal) engineer, the general ways engineers approach solving problems, and public policy. Traditional lessons on engineering have a heavy focus on math and science, thus, I chose to essentially ignore those areas to contextualize the skills black boys need to succeed in engineering. Black boys exemplify useful life skills naturally, but in the context of school many of the ways they express themselves are deemed socially unacceptable. The promoted attributes for success in school are often anti-black and may favor behaving in ways that are not traditionally seen as masculine. Especially in any context where black boys are overwhelmingly present like urban schools, docility and conformity are rewarded while outspokenness and self-expression are criminalized. Therefore, I talk about the attributes of the ideal engineer in a way that allows black boys to see skills they already possess (or may want) as useful in this career/discipline. For me, this is the essence of asset-based education, not focusing on kids who've been successful all-throughout their life (at least that's how some exemplars are depicted) and have had little difficulty because of their privilege and circumstances beyond their control. For example, one aspect of an ideal engineer is being a social "expert." Basically, this means understanding people and being able to healthily navigate social spaces and interactions with others. Black boys are generally seen as social leaders in the classroom, but the "push-out"

phenomenon leads them to exercise their influence in negative and self-defeating ways. Many black boys are leaders but need help re-channeling their skillset in a productive manner.

The engineering habits of mind (eHOM), with their composition of values, attitudes, and thinking skills useful for problem-solving provides transcendent attributes that black boys can use within and beyond engineering. Things like creativity, communication, and collaboration are beneficial in any context and help students not only exhibit these skills, but they gain knowledge and practice on how to do them well. Black boys may work well as teammates on the athletic terrain but not use the same skills in the classroom, I use eHOM to help the boys develop a reciprocating awareness of how to use their intelligence effectively, as they perform various activities within and outside the classroom setting. This pedagogic frame is inspired by my belief that black boys (and all kids) need skills that will help them succeed as responsible and informed citizens, as a pre-requisite to those that will help them succeed academically, because regardless of whether they matriculate through school they have the potential to positively impact society. During the latter part of the class I began discussing eHOM, for greater depth of instruction I only explained two eHOM concepts per class session, and then asked the students to relate them to one of their own interests to help them better understand the concept. For example, I would explain systems thinking, then have them give me an example of systems thinking in basketball or music or whatever they chose. As a scaffold, I would provide an example of the concept using the process of riding a bike, which they may or may not do regularly, but the activity is easily understood. The purpose of this strategy is trying to help them see the relevance of engineering thinking in their own lives, beyond doing engineering work. I may not be able to go as much in-depth as I wish, but at least the seed will be planted. Engineering thinking is often left out of K-12 engineering educational experiences as it is assumed that students will inevitably develop

such skills because they practice the engineering design process or do problem-solving activities with various technologies, but I believe it is necessary to be intentional about teaching these concepts in engineering education programs, especially when it is societally unpopular to doing real thinking. Students, especially black boys given what they will face, must be encouraged, challenged, and trained to do this.

There's a program in Detroit called Detroit Area Pre-College Engineering Program (DAPCEP), which is a program youth participate in to learn about engineering and it has programming across the K-12 spectrum. When I was younger I participated in this program, I vaguely remember getting up on Saturday mornings and going to one of the local universities for the program. It was something to do, my mother kept me pretty involved in many programs, but I remember thinking it was boring and eventually I became uninterested in participating. I'm not completely sure if the program influenced my interest in engineering because I participated before entering high school and did not do any engineering-specific programs thereafter, but as I think about the course I am doing now I try to think of what I wish would have taken place in that program. I remember we did the typical bridge-building type activities, but it all seemed very academic or school-like and lacked free creativity and relatability. The problems we had to solve were given to us and there was usually some correct way to produce the optimal performing solution, there was not an explicit cultural education though most of the participants and educators were black. Essentially, I would have liked to include more of myself. And even though the content wasn't directly related to my life experiences, I wasn't sure it was related to school content either, like grade-appropriate or applicable. I mean I'm not sure I would have performed better in math and science in school because of participation in those activities or the broader program. I think black boys need connectivity in their learning, their educational

experiences should build upon one another, though I know this is hard to do across subject matter and environmental contexts.

Educators must be flexible in their ability to interweave various academic and personal topics not simply because the topics are important but because students will learn better when they are engaged, mentally and physically. Also, I believe this is how educators can foster learning that is decontextualized and relates directly to their life outside the classroom. I have to demonstrate instructional flexibility constantly during the class, one example in particular stands out because it was a day when only one student came to the session.

*So, I started class with one student again, the most faithful of the bunch, and we first discussed his study habits as the school year is almost over and final exams are near. When I was younger people told me to study but didn't really explain what that meant, what were good study habits, they didn't explore what I did to learn information outside of school. As the student explained before it sounds like he just tries to memorize different information just before his exams, his teachers also put in checks like daily quizzes to force the students into preparing regularly for class.*

*We then moved into discussing the final two engineering habits of mind, which filled out the engineering part of his chart and then he thought of his own examples to complete the chart. The concepts of the day were optimism and ethics, he mentioned being optimistic about making it into the NBA. I then began asking questions to broaden his perspective about what it means to play in the NBA, who are the different stakeholders, and what it means to engage in different roles. We discussed the numerous stakeholders and of them who exerts the most physical energy, who is the most financially compensated, who has the longest careers. All of this was to help him see that players, though most celebrated, are most exploited. This conversation is necessary I*

*believe not just because of the probability of his chances in making the NBA, but more importantly regarding his ability to control and enjoy his life, having autonomy in his career, because as black men we have so little agency in many aspects of our lives, regardless of our education or socioeconomic status.*

*We then moved to his design project which occupied the majority of the class time. He wanted to do a new problem, so I helped him think through a new problem statement. After making it specific we moved into thinking about what he could build to address the problem, he struggled to think of something, which I think may be due to low confidence in building or making things. To help, I suggested he consider creating a process or non-tangible product (e.g., a website) that can address his problem. From there as he mentioned his idea, I walked him through the steps of the engineering design process to determine the details of what he wanted to create. I believe the back and forth feedback was very helpful for him, to have time to think, share his ideas, get immediate feedback, and refine his work with my suggestions. He continued to develop his idea and towards the end of class I wanted him to get feedback from peers, so I told him to think through a 30-sec to 1-minute pitch where he could market his idea to kids his age interested in playing professional basketball. After he got it together, we went outside for him to get practice. He first showed signs of nervousness which were normal, but he soon relaxed and was able to share with another boy who has attended the class his idea and ask if the boy found his idea interesting and a potentially useful service. Unfortunately, we were only able to speak with one peer, but the process I think was useful in giving him real practice and experience in modeling what engineers do as they design processes and products.* [my teacher/researcher journal, 5/18/18]

I included this entry because I was proud of myself. I admit it, sometimes I must (or just want to) give myself a pat-on-the-back (i.e., self-affirmation). I had a few options that day when only one student showed up, stay and teach, cancel and go home, or stay and play (video games, basketball, etc.), I chose to stay and teach but that's not what I was proud about. That day was the eighth class session, with only two more sessions (one of which was going to be mostly presentations and official concluding of the class) no progress was made with group projects, I felt slightly remorseful because I didn't feel I went as in-depth with engineering content as I did with discussions on scholar and racial identity, and I hadn't planned much for the session because I expected more students would show and they'd spent the majority of the time building their designs. I was caught off-guard, but as I began talking with the student I realized he was undeterred by being the sole pupil, he was comfortable, he was engaged, he was ready to learn, and so I fed off his energy, I determined the day would not be wasted. I spend so much of my time trying to encourage youth, that I am wonderfully stunned when they encourage me. His readiness encouraged me! Not just because he was ready, though that was enough, but in that moment, I was fully aware of my assumption that he would rather go home or play basketball; surely, *I* could not have underestimated his desire to learn, the myths concerning black boys run deep, and even I, *black man*, have fallen prey. But I recovered, and we were able to have some important conversations and he completed his project.

We revisited the topic of black men in sports, talking specifically about basketball and I was able to initiate a more comprehensive and nuanced conversation. I believe multiple points of contact is an effective teaching tool with black boys, sometimes that means physically being with them at multiple times in different places, other times that simply means touching on a subject/topic multiple times. I don't think this educational tactic is unique to black boys, I think

there needs to be an intentional effort with them because of the other messages and concerns that may be of prominence to them. Some folks feel black boys should be seeking them for the knowledge and resources they have to offer, having been a black boy and understanding who and what else is vying for their attention I'm willing to fight for their affinity. Additionally, I had to be attuned to the student to notice that he did not feel comfortable trying to work on building something. I am similar. Even to this day, things traditionally associated with engineering like Legos, robotics, and 3-D printers are not appealing to me. Broadening participation in engineering includes broadening the way engineers are typified, thus, I shifted from offering a building project to telling the student engineers also engineer processes. This simple variation noticeably changed his ability to relax and do the work, which resulted in a product that he took great pride in developing. The icing on the cake was the opportunity for him to speak with a potential user, an important aspect of engineering design. He created his own spiel to explain his product and was able to share with and get feedback from one of his peers on his idea. At the following class session, more students attended, and he was able to lead the other students through the engineering design process, and I even gave him the opportunity to present his project on the final day of class to his peers and the parents that came. He beamed with confidence, and though it was a small feat it was gratifying to me as well. Engineering subject matter is different from other subject, which is why there is a growing number of doctoral programs for scholars to explore the best ways of teaching it, among other things; likewise, it has the potential to provide a different type of learning experience to black boys when taught from an anti-racist framework.

**Problem-Solving: Where Engineering Meets Politics**

*I fail to see how the movement can be victorious in the absence of radical programs for full employment, abolition of slums, the reconstruction of our educational system, and new definitions of work and leisure. Adding up the cost of such programs, we can only conclude that we are talking about a refashioning of our political economy.* – Bayard Rustin

I am amazed at how much I have refined, and even transformed in some ways, my outlook on black male education within the last four years. Prior to my doctoral program, I never imagined reading so many books and academic papers in my life, let alone in four years, but I'm grateful for it all (even the stuff I disagree with). One of the areas where I've had a perspective shift is my conceptualization of politics, and its essentiality in the education of black males. For most of my life I thought that anything supposedly good done by the government did not affect the communities I lived in, nor other urban black communities across the nation. I thought that all politicians were liars and manipulators that exploited black people to gain their support and do nothing to support us once in office, and those who did not enter politics that way were (or are being) converted to operating that way if they stayed in that corrupt system. I figured voting to be a waste of time, blacks concerned about the wellbeing of black families and communities were always choosing between bad to worse, it was more about who you did not want in office (national on down to local representatives) rather than who you did. And then the first presidential election I was able to vote, Barack Obama was running so I voted for him because he is black and seemed decently moral. I started doing things I'd never considered before, like watching the State of the Union address. Along with watching other presidential speeches, I began slightly paying attention to policy initiatives and political happenings. Over time I became disillusioned with President Obama's willingness to do anything meaningful for black people. I read about his background and realized he wasn't the man I/we/black people thought he was, this

was both enlightening and disheartening. I became aware that politics were much more complex than I expected; nevertheless, I pondered if the best we can get is a representational symbol from a black man in the oval office then what hope have we via political means (perhaps a surprising revelation from a fellow black male but when President Obama scoffed at the idea of reparations for black Americans who are descendants of enslaved Africans, that among *many* other things was a major disappointment for me).

During Obama's presidency, there was an exponential uptick in the mentions of politics in my surroundings, but it was mainly around the social phenomenon of Barack Obama rather than his administration's political moves, so I figured I was fine with my political apathy. That was until I was offered an opportunity to give a small speech on Rev. Dr. Martin Luther King, Jr. I knew enough about King to know that the dominant narrative about him has been co-opted to portray him as a watered-down, digestible-for-white-America version of who he actually was and the specific things he advocated for, but I didn't feel I knew enough to speak publicly about him (in a speech), so I read his autobiography and a few other documents to learn more about him. I learned a lot, gained a deep admiration for him, and transformed my concern for politics, to the point where my wife now says every conversation I have ends up being about politics in some way (which, of course, isn't true). What did it? Well, Rev. King commented at least twice on the need and power of legislation, and though they basically say the same thing, they were mind-altering for me:

> 1) And so while legislation may not change the hearts of men, it does change the habits of men when it's vigorously enforced and when you change the habits of people pretty soon attitudes begin to be changed and people begin to see that they can do things that fears caused them to feel that they could never do. (The Other America, Grosse Pointe High School, March 14, 1968)
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> 2) It may be true that you can't legislate integration, but you can legislate desegregation. It may be true that morality cannot be legislated, but behavior can

> be regulated. It may be true that the law cannot change the heart, but it can restrain the heartless. It may be true that the law can't make a man love me, but it can restrain him from lynching me, and I think that's pretty important also. So while the law may not change the hearts of men, it does change the habits of men. And when you change the habits of men, pretty soon the attitudes and the hearts will be changed. And so there is a need for strong legislation constantly to grapple with the problems we face. (University of California – Los Angeles, April 27, 1965)

I think these words still ring true today, 50+ years later, that we need law and policy to restrain, and even further the government is the only institution with the capacity to rectify the United States' past and present transgressions against black people. But as a community blacks must overcome growing apathy toward political happenings, we need knowledge and understanding of the governmental domain and how policy works. It's certainly an uphill battle, but a necessary struggle nonetheless, to hold the U.S. accountable to its ideals.

Fortunately, there are numerous scholars who have spent their careers studying effective political education of youth, particularly urban black youth. These scholars discovered great disparities between black and white youth in their civic education and analyses of their civic engagement. Furthermore, scholars noticed a connection between young people's civic identity and their relationship to their community. As I reviewed this literature, I noticed a similarity between the engineering habits of mind and the civic habits of mind (I'm not referencing a specific list of concepts, just the general skills and attitudes I learned about in civic education literature). Accordingly, I was hoping the *Project Citizen* (PC) curriculum would serve as a helpful introduction, or reinforcement, to public policy and build the boys' efficacy around causing change and transformation. I considered it another seed-planting activity that would hopefully stimulate a positive disposition and interest in the rights and responsibilities we have as citizens of the U.S., and how some restrictions apply for blacks. Historically, blacks have had to disobey unjust laws to earn the rights theoretically guaranteed by the law. Therefore, tension

exists within me because I want to encourage the boys to think about civic engagement, but I also feel a responsibility to let them know the traditional methods of voting, creating petitions, and so on don't work for us. I could have provided numerous examples, but I wasn't sure that was the best thing to do with the limited time I had with the boys, and I had to be careful of the ways in which I influenced their thinking. Also, I'm hoping it will be somewhat empowering for the boys to think through problems in their community and work through brainstorming solutions and pursuing the actualization of their ideas. I want to inspire these boys to do things they may not have seen before, so exposure, education, and experience must come first.

We had a lot of discussion in this class, I wanted to know what the boys genuinely thought and felt so many times I delayed or discarded planned aspects of the class to allow for more conversation, between myself and the boys and it was joyous to watch the dialogue among the boys and with each other. Today's black youth know about the #BlackLivesMatter movement and perhaps some other activist groups, but they don't know their local governing officials. Honestly, I don't even know who they are. Most of my life I was simply told and encouraged to get a "good education" to be successful, with no training on how to navigate social and political aspects of life. I learned social skills as I went, learning from various experiences and adapting my behavior based on what I witnessed, this was bolstered further when I attended Tuskegee and learned how to be professional in a way that reflects my racial culture. Now, I teach with that in mind, always wondering how I can prepare black boys (and girls) to identify the problems they endure and equip them to devote effort toward the elimination of these issues. Activism and protesting are needed, but they are not the only way to be effective, and some people would prefer a different way of pursuing justice. Initiating a

conversation with young men and actively listening to them can be a tool of allowing them to wrestle with these realities, here is a reflection on how I approached that process in my class:

*For this class session, I want to start with a discussion around the feelings of the boys about politics and government. Asking questions like, are they concerned with community and societal issues and whether they can be solved by governmental policies (why or why not?), do they trust their local or national politicians (why or why not?), do they regularly talk about politics with their friends and family, these concepts are important because generally when the government, politicians, or public policies are discussed with youth (inside or outside school) it's in a very positive and uplifting way. Students are encouraged to be "involved" and told the politicians that supposedly represent them are concerned and will listen to them. For black people, especially those in impoverished communities, this is NOT true. It hasn't been the case since our ancestors were brought here and enslaved in 1619. So, I feel it is my job to follow-up a conversation about the benefits of public policy and our need to be involved, with a conversation contextualizing what this means for black people. I anticipate the boys are aware of the disparities between American political ideals and their lived experiences, but they may need help finding language or feeling comfortable discussing these issues. However, I could be wrong about my expectations on how they will feel or their ability to articulate how they feel. My goal is to promote the dialogue. The way I see this all related to engineering is regarding problem-solving. Engineering also is usually presented in a very positive manner, kids are told they can change the world and help people. Even though most of what engineers do hurts black people, or at best ignores their concerns. But within the lexicon of engineering is the proclamation of being problem-solvers, critical thinkers, humanitarianism. During this session, we will begin to transition into*

*how the engineering habits of mind (eHOM) can help students become problem-solvers, critical thinkers, and humanitarians in a legitimate way. The eHOM are defined in terms of engineering but are really transcontextual skills, attitudes, and values.* [my teacher/researcher journal, 5/3/18]

Before I wrote this entry, I had recently finished the class session where I introduced the PC curriculum to the boys. We discussed our country's governmental structure (which I explained is not a democracy despite being frequently stated as such), the roles and responsibilities of local political officials, ways the boys can increase their awareness of public policies in their city, and how they can practice creating or modifying policies to address problems in their neighborhood. The next class, after I wrote this entry, we talked about the boys' trust and satisfaction with elected officials and the government in general, and how often they have conversations about politics with their friends, family, and teachers. Fortunately, a lot of the students showed up when we had this discussion and we ended up spending much more time than I planned to talk about politics and government because the boys had so much to say about their perspective. Their sentiments were overwhelmingly a distrust in elected officials, they said many of them talk regularly with their parents about politics, and they maintained this idea that people are responsible for addressing their own problems in the community as they stated things like, "that's not my business." When I asked them who's responsible for the state of national/local politics and what can be done about it, no answer. We did not go through the entire PC curriculum but using the provided activity and discussion prompts, I believe, helped make politics more specific and relevant for them. We moved beyond "general politicians and elected officials" to naming the people making decisions that affect their lives daily, we went from

ambiguous “community issues” to naming the specific problems they see as making their lives difficult and contributing to unsafe/unhealthy living environments.

The class discussion on politics led to an exercise, I gave them a brief definition of public policy and gave them time to select a community problem that affects black boys. I gave the boys a few minutes to think of at least three community problems. As they told me the issues they selected, the list compiled included the following: racist police officers, gun shooting, fighting, littering, drugs, gangs, lack of diverse governmental representatives, and school miseducation. Some of these issues were identified individually by multiple students, with racist police officers being the most identified, perhaps this is due to the abundant cases propagated throughout mainstream media of police brutality and murder of black males, and black women. Moreover, these are very violent and traumatic issues to have to deal with on a regular basis, especially as youth. I think it has become so prevalent that these pernicious circumstances are normalized, and black boys are expected to cope and still be successful in their social, emotional, and intellectual development. This is a major problem. Research exists that discusses how such community issues impact students’ learning, but little has been done to prepare teachers and school administrators to modify their teaching and management to account for these realities.

As we discussed the importance of these issues and whether governmental agencies have any responsibility in addressing these issues, previous themes of governmental ignorance showed up again. Part of why I structured the class as I did is to address this gap in information, the boys are old enough and intelligent enough to know about these issues but for whatever reason they are unaware of whose responsibility it is to resolve these issues (this was my experience as a youth), or they misplace responsibility (placing sole responsibility on individual actors). How then can they help them be solved? It was clear they want the issues resolved but have no idea on

how to make that happen, which can easily translate to resignation and hopelessness. These conversations are not to demean the students but to explore their knowledge and educate. Our talk also led to more nuanced conversations around how gangs are formed and why do people form/join gangs. Amidst all of this we were nearing the end of the course and there was still work to be done on projects, I initially wanted them to all work on one issue to develop or modify a public policy to solve the issue (due to remaining time), but when it was time to select a focal issue they split between two issues. I saw this as an opportunity to have them interact with each other, in a somewhat academically/intellectually competitive manner. I told them to discuss, among those to who voted on the same issue, reasons why the other students should join their group and work on their issue. This appeared to them as a debate on which issue was more worthwhile studying and a contest to beat the other team, in actuality, it was an exercise in practicing argumentation. It wasn't about the issue to me, I wanted them to take ownership of their issue and display some passion in stating the value of putting forth effort to brainstorm solutions to their topic. When the students originally voted they seemed very interested in the issue they chose, so I planned to allow two groups anyway, but the activity allowed them to exercise their communication and argumentative skills while building their interest and motivation to study the issue. It worked very well. One thing to note was that later in that meeting two more boys showed up, when they were informed on the activity and presented with the two issues they joined the group focusing on racist police officers without hesitation, further exemplifying the prominence of this issue to these young men. At no point did any students say this is not that big of an issue, it is common sense to them, and the fact that they see racism in policing as common sense is a major problem. I then had the students work in their groups to specify a segment of their topic to focus on (awareness building, information gathering, etc.), and

then use the engineering habits of mind to articulate the components involved to developing a problem-solving policy. They could create an entirely new policy or modify an existing policy. What I hoped they understood is that it is easier to identify problems we experience, but it is not as easy to develop solutions or even to know who is responsible for solving community issues; therefore, we have to spend time informing ourselves and others as a basic step to political competency. Moreover, political will and coalition building are necessary to bring about change.

**Exploring Student Perspectives**

Amid one of my researcher interviews, the interviewer asked a question that stunned me, "How do you think they feel about [you teaching the class]?" My initial thoughts were, 'Ummm, how am I supposed to know?!?!,' and then I was challenged by the interviewer to find a way to answer that question. Before I share what I eventually discovered, I want to revisit that moment I was momentarily speechless:

Interviewer: How do you think they feel about it?

Me: I think that's one of the….personally, I feel like in terms of expediency, the way I designed this dissertation, is great. But in terms of like, getting perspective, that's one of the biggest flaws I think, is not baking in any point to ask their perspective. Uhhh, I am, being completely honest, I think it's going to help [me complete my dissertation] because I focus on myself, but I think that's a part that I'm missing, is really how they think or really asking them.

Interviewer: …you say this dissertation is focused on you, but at the same time like, part of your own development and growth will be, like asking them like what you mean to them. I mean, right? In some ways, I mean clearly this experience means something to you, and you're going to carry it with it. But it also means something to them?

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Me: Yeeaaaa, I literally have not thought about that…I don't think much about what the kids think or, I don't know if that's like a self-protective thing. Like I'm just like, I don't want to know because if they don't like me then I'll be disappointed, feel bad, or if it's just easier not to think about it, not to feel a connection because I know it'll be

> so short a time. Even with the [tutoring program] I think it might be a sub-conscious thing to not think too much about connections and impact on them, I mean, just hope it's good, but I don't know if I can really handle even knowing. (edited interview transcript, 5/10/18)

This excerpt is an edited version of the actual dialogue to increase (slightly) the coherence and readability of my responses. At the time, it felt as if someone had discovered something I was hiding, and I was both embarrassed and dumbfounded as to how they located that hidden thing. The hidden thing was fear, my fear of thinking I was doing something really good for these boys and being told it wasn't as good as I thought it was. Educators of black boys must be willing to investigate how they are experiencing our presence and our teaching, separately in fact. They can find comfort in my black male identity and yet feel my instructional practices are just as grievous as other teachers', or they may be apprehensive at first toward a white woman, but transition to feeling at ease as she provides a liberative learning atmosphere. Whatever the case, we must allow black boys to genuinely verbalize how they feel in our learning environment. If done with sincerity and humility, black boys may feel reassured that their presence, and voice, matters, which can motivate them to engage more, and it helps the teacher become aware of what they are doing that is un/helpful. Beyond the response of the students to how they felt about my presence and teaching, the interviewer mentioned an interest in my response to the responses of the boys. Not only asking them about how they feel, but then acknowledging how I feel about how they feel. This was heavy, but necessary. I accepted the challenge, I modified my planned activities for the following class session after my interview to make time for discussion around how the boys thought/felt about me, as a black man specifically, teaching the class. When class began there was only one student in attendance, others came eventually, but I was not sure if more students would show so I spoke with the one student about the value of the class to him:

*I scrapped most of my lesson to have an in-depth conversation about whether he thought the class is beneficial for him, and if so, in what ways. How can it be improved and what has he learned, if anything. He said the class is "dope," he's mostly the only black kid in his classes so he likes being around other black boys. His school is P-8, and yet it is essentially all-white. I asked him what specifically about talking with other black boys is helpful, he responded it helps him to know himself more, it's different from talking to white kids at his school because they're not as open and direct in their communication, only a few people does he feel fully comfortable around. Boys in the class say what they want how they want, that makes him feel more comfortable. He specifically said, "I can be all of myself" in my class, that was surprising, encouraging and cool, but sad. His previous school had an ethnically diverse population which he said was very different, though he feels his current school is preparing him better. Yet, he says the focus is memorization.* [my teacher/researcher journal, 5/15/18]

In this conversation, the focus ended up being more about the student's interaction with other boys through my course than with me, again a dynamic of the course I had not considered. Notwithstanding, I was glad to hear the level of comfort he experienced being amongst same-race peers. It could be underestimated or overlooked the value for youth of being around each other, specifically those with the same race and gender. Some of the students knew each other prior to the class because they lived in the same neighbor and visited the center (serving as the research site) frequently, others attended the same school, but all of them were not familiar with each other before the course. However, they all established a high level of camaraderie that enriched the classroom experience and even extended to their interactions before and after the class on the basketball court, and in general. Later in the course I had a similar conversation with

another student in the class to explore his perspective on my presence and teaching in the course. Here's how that conversation went:

> *After the one student shared his answers to my questions for the presentation, I realized he had not been present when I asked other students about why he came and the value of my presence to him. Although he considered me better than his schoolteachers, he said he mostly came because he did not have anything else to do. Then I asked if he'd had any black male teachers in school and he responded that he hadn't had any full-time black teachers during his [entire] schooling. He said there wasn't any black people working in the school besides the cafeteria and custodians. I asked him would more black teachers make a difference, he said no "teachers are teachers," but some teachers treat the white kids better than the other kids. He saw teachers as just being teachers, probably because he hadn't had any black teachers to show him any different, but he didn't even assume they may treat students more equitably than they are currently treated; furthermore, he seemed resigned to the partial treatment already taking place in his classes.* [my teacher/researcher journal, 5/30/18]

I appreciated this student's honesty about his reasons for coming, and I was not bothered that he only came because he felt he had nothing better to do. He actually participated a lot when he attended the class, and quite frankly, the project would fail if the boys didn't come so I was more concerned that they came than for the reasons they came. I have spent most of this paper deliberating the difficulties that confront black boys in schools, and I have read literature on the impact of same-race teachers for black boys, which is amplified when the teacher also has the same gender, thus, it was discouraging to hear that this young man had not had one black male teacher in his K-8 schooling besides substitutes and physical education instructors. Let me speculate what difference a black male teacher could have made for him, firstly, black male

teachers often serve as positive role models for black male students. As long as negative myths about black men continue to dominate mass media and public discourse, there will always be a need for more and more black men to help prevent young men from believing such lies. I know a black male teacher that created an after-school audio/visual program to improve the students' literacy skills, introduce them to media technology, and allow them creative ways to express themselves, perhaps something like that could have occurred for the student in my class. While I was in the middle of the project I watched a workshop facilitated by a well-known male educator in California, he discussed his non-profit work on providing a space for males to express themselves openly amongst each other. He presented an activity that help people reflect on the masks they wear daily, in his work he tries to help boys take off the mask we feel we must wear as males, perhaps if my student has black male teachers in his schools they'd be willing to start something like this, or maybe even just replicate the activities for their male students. As in this project, black males are generally aware of the difficulties facing the black male youth they teach, and while it doesn't guarantee they'll do anything about it, the chances that they will (or can) are zero when they are not present. The same student I was speaking to had been suspended shortly before our conversation because he had too many tardies, this was originally an in-school suspension, but he missed school when he was supposed to serve the in-school suspension, and it escalated to an out-of-school suspension. A black male teacher could possibly intervene and advocate for an alternative disciplinary procedure because he recognizes the more the student is out of class, or worse out of school, the more his learning is impaired and whatever problems he had before are magnified. Many schools have black males in the building primarily to serve as disciplinarians, but black male teachers have the potential to shift the pedagogical culture of the school due to their proven ability to navigate a system where the odds are in favor of their

failure. How is this political? I believe mass incarceration/the prison industrial complex/the school-to-prison pipeline is directly correlated to the low number of black male teachers. The disproportionate number of black men in prison limits the number of available candidates to pursue teaching as a profession, but the factors that have made schools hostile and violent places for black males prevent them from wanting to work in (or be near) a school even if they are not incarcerated. How is this engineering? It is a complex 21st century problem that needs to be solved, which requires higher-order thinking skills, and will definitely help people.

One of my biggest regrets about this project is not including the parents in a direct way. I do believe that to truly help black boys it is necessary to engage and support their parents as well, but I chose in this case to focus mostly on the boys. Due to the personal relationships I had with some of the boys' parents, because of being involved in their community multiple years, I was fortunate to gain some perspective and feedback from some of the parents during the project. Educators of black boys must build healthy relationships with their parent(s)/guardian(s), from an ecological systems perspective building trust and connectivity with the caretaker(s) of black boys is perhaps the most advantageous way to support/promote their learning and development. As I conclude this chapter, I want to share one excerpt from a journal entry where I reflect on the fact that there are just as many misconceptions about black parents as there are black boys.

*After class I spoke with a couple parents of boys that had been severely absent, in one case the mother simply apologized and stated she is exhausted after work and forgets to bring the boys, the other mother said her son had baseball practice. The mothers expressed that they still believed the class is/was beneficial experience for the boys and how they wished it lasted longer. We spoke for about 40 mins on topics ranging from allowing the boys to speak openly [about how they feel], to ways to help them study and learn, to how some of the boys wanted to*

*return to their original hometowns, but the mothers think Lafayette is safer and has better schools. The conversation re-affirmed the value of the class, but it also re-affirmed my belief that black parents do care about the education of their children contrary to popular belief. I wouldn't say it's most important, at least not if measured by their actions, but it is indeed of value. However, many, because they themselves did not receive a high-quality schooling experience and do not pursue academic learning on their own, do not know how to assist the academic developmental process for their children. They need educators to assist them in understanding the things they need to do to help their children's learning, though this information sharing must be done with compassion, grace, and understanding of the parents' circumstances. Often, they are dealing with many other stressors, they have the same community issues the boys expressed, and other adult responsibilities to manage which may prevent their effective engagement with their child's learning and development. They need collectives and community, so they don't feel alone, which can easily lead to feelings of inadequacy and cause hopelessness in this regard, despite being resilient in many other areas. They need prodding and pushing, because from the perspective of an educator, or outsider, what is perceived as not-caring can be symptomatic of something very different.* [my teacher/researcher journal, 5/23/18]

When the boys didn't show up for class I thought about various reasons why they were absent, but their mother being too tired to bring them after work was never one. Of course, for the students that lived in the neighborhood of this site this was not a legitimate excuse, in fact, I would interact with students that lived nearby before class sometimes and they still didn't attend. Educators of black boy must identify and scrutinize their biases, especially if they tend to think negatively in situations involving black boys that they do not when the race/gender of the student

is different. The same can be said for their caretakers. These mothers were concerned about their sons' performance in school, and their characters and maturing masculinity. They mentioned mother-son reading times, homework policies they enforce, and other ways they support their sons' learning, while also expressing a lack of confidence in their ability to help their sons with school. This didn't make sense to me, I figured somewhere at some point they got the message that they were incapable. Parent(s)/guardian(s) ought to be reassured that they are their sons' primary teachers, and that even when they don't know how to do something their sons are observing how to respond to similar circumstances. Additionally, caretakers may need help healing from their own traumatic schooling experiences to be in a position to aid their sons in successfully navigating the schooling system.

**My Life's Work: Re-engineering Education for Black Boys**

*Schooling that was always intended to instill loyalty to and prepare us to serve a special order that oppresses us must be rejected and replaced with a liberating education.* - Jacob H. Carruthers

Black males want to be engineers, but I am not convinced the engineering community really wants us. K-12 engineering education has an expanded presence in the pre-college schooling domain and unless intentional steps are taken to redress and resist racist educational practices, K-12 engineering educators will absorb and perpetuate the same prejudicial anti-black traditions already ruining the lives of many black boys. The stakes are far greater than the need to increase the representation of black males in engineering programs and careers. I believe sociopolitical teaching in engineering, which can take many forms, can serve as a powerful intervention to disrupt the trajectory of so many black boys being pushed out of the schools into prisons, caskets, or life in the underclass. The supposed engineering pipeline/pathway issue is really just a misunderstanding of systemic oppression. Black boys are in survival mode, unable

to think about thriving, their plight is not of their own doing and they cannot change it by themselves. Educators cannot provide all of what is necessary to transform the way society sees, and serves, black boys, but significant progress can be achieved if educators choose to adopt an anti-racist approach to teaching and interacting with black boys.

Since about 2006, there has been a growing effort to infuse engineering education into the K-12 academic experience. A significant amount of research has been focused on creating and adapting school curricula, while also developing opportunities for youth to learn and experience engineering outside of the school environment. Researchers and school teachers have begun to explore content and pedagogical strategies that will best allow youth to identify with and understand engineering (NAE & NRC, 2009; Strobel et al., 2012). Additionally, college/university stakeholders and general educators have created camps and extracurricular experiences to introduce youth to engineering and develop their STEM literacy. In some cases, these efforts are simply to expose youth to engineering whom may not otherwise have gain such experiences. On the other hand, these camps and activities are used as recruiting mechanisms, serving as a pipeline for youth to establish and build relationships with some post-secondary institution(s). My research project was a seminal effort to re-engineer the education of black boys by exploring how to teach engineering in a liberative manner. I aimed to offer an alternative point of focus for K-12 engineering curriculum (e.g., engineering thinking), while advocating for a better way of teaching black boys altogether. The current emphasis in K-12 engineering activities are centered on design, and mathematical and scientific skill development. The engineering design process provides a framework for youth to engage the problem-solving exercise by offering a step-by-step procedure, though some competency with science and math concepts are necessary to produce engineering solutions. Therefore, it is not surprising that these

elements are prevalent in most (if not all) pre-college engineering activities and experiences. My argument is that the third element of K-12 engineering education, engineering thinking, is largely ignored by not being included in any meaningful way in pre-college engineering activities and experiences. Furthermore, according to current statistics on science, math, and reading proficiency, the probability of most black males even considering pursuing degrees/careers in engineering is very low (NACME, 2014; NAEP 2015). This means that the potential of youth utilizing engineering design principles in any significant manner is low, though increased math and science skill development can be very beneficial for academic success. Still, being trained to adapt the problem-solving thinking processes of engineers can arguably be considered the most profitable investment for engineering education, because black males, and youth more broadly, can employ engineering thinking whether they become professional engineers or not.

Black males have two glaring issues regarding our citizenship and education. First, we have been, and continue to be, viewed as a threat to civility and the safety of others. In the U.S., there exists a widespread implicit bias to fear Black males (young and old). This reality impacts the way we are socialized during childhood, and the ways in which we can/not engage our community. Second, the educational setting (beyond just schools) is a stronghold against the intellectual development of black males. Black males are viewed as intellectually inferior and are judged more for their behavior rather than their intellectual competence. Black males are over-disciplined, overrepresented in special education courses, excluded from advanced placement opportunities, and essentially ostracized in classrooms and formal learning settings. This eccentricity is well-known in the research literature, though no solution has been consistently or systematically implemented to curtail this epidemic. My desire with this project was to study how engineering thinking can be taught to black males to help them navigate the obstacles of the

educational space and society at-large. My aim was not simply for them to overcome these barriers, but to become self-determined change agents committed to exposing and rectifying these injustices. I want these young males to feel empowered to enact social transformation, to pursue personal and professional advancement with social responsibility.

Through this experience I have grown in my awareness of myself, my raciogender community, and how to transfer research to practice. I think it would profit all educators to employ some form of autoethnographic reflection, because evaluating the aspects of my life that shaped me and analyzing my cultural paradigm was helpful in thinking of the ways me and the boys were similar and different so that I addressed various topics with consideration of their specific context. Teaching is not a neutral activity. Even when educators desire to exercise liberative pedagogy, our selection of methods and materials are the result of our subjectivity in determining the most effective way to foster free thinking. Resultantly, my life events led me to merge black racial identity, black politics, and the dynamics surrounding the education of black boys to teach K-12 engineering within a critical race pedagogical framework. I was socialized to be present and authentic among the people I want to lead and serve, hence, my devotion to community-engage scholarship. I grew tired of watching educators give-up on students or become volatile, therefore, I spent time with the hyper-marginalized to build up the requisite resilience to avoid dysfunctional teaching and a cynical demeanor. I have felt undervalued and left-out in some classroom experiences, so I prioritize connecting with students over presenting content. I've witnessed engineering educators ostracize and belittle students unwilling to assimilate to its cultural norms, contrarily I taught black boys with the goal of making engineering relatable to them, not vice versa.

# EPILOGUE

*In order for us as poor and oppressed people to become a part of a society that is meaningful, the system under which we now exist has to be radically changed. This means that we are going to have to learn to think in radical terms. I use the term radical in its original meaning—getting down to and understanding the root cause. It means facing a system that does not lend itself to your needs and devising means by which you change that system. That is easier said than done. But one of the things that has to be faced is, in the process of wanting to change that system, how much have we go to do to find out who we are, where we have come from and where we are going…I am saying as you must say, too, that in order to see where we are going, we not only must remember where we have been, but we must understand where we have been.* – Ella Baker

I entered Purdue University's Engineering Education doctoral program four years ago, with the intention of studying how engineering thinking could be taught to black youth as a problem-solving strategy for the everyday problems they experience. A lot has changed in four years. I prepare to exit the doctoral program devoted to the liberation, empowerment, and education of black males. What happened? I became radicalized. As I scrutinized the proposition for broadening participation in engineering or all people, I concentrated my attention on the case of black males and examined why we are underrepresented in the engineering community. I explored black history, engineering history, and the history of the schooling system, independently and in conjunction, as I sought the root causes for this dilemma (to *know* them and to *understand* them). I found they are all tied together, suffering from a commitment to white supremacy over an equitable society. Wharton (1992) succinctly describes the system blacks must overcome to succeed in engineering:

> American higher education, the fount to which all prospective engineers in this country must come, has been a preserve of the white power structure since its inception. It was made so by whites, not by blacks. It was made so by the

> exclusion of blacks from the preparatory programs that lead to full participation in the fields of technology. (p. xi)

Wharton's comments led me to believe, as Ella Baker suggests, the key to full inclusion and increased representation/participation of poor and oppressed people (both of which blacks are overrepresented) is a completely different societal structure. Therefore, the way engineering is understood, taught, promoted, etc. within K-12 Eng. Ed needs to be transformed as well. I began to understand the issue of underrepresentation of black males as a justice issue, though overt racism and discrimination have greatly declined.

I enjoyed designing and facilitating this research project, but I also felt the emotional weight and potentially limited impact of this project. Across the country, engineering stakeholders (politicians, industry professionals, university officials, etc.) are promoting engineering to young black males without considering the mountainous barriers they must overcome to satisfy such solicitations. As I write this dissertation I am an employee in a public-school district that is over 90% black and low-income, with 75% of its schools experiencing water shut-offs (since the first day of school) because the water is contaminated with lead. Ironically, one of the 14 grand challenges for engineering in the 21$^{st}$ century is providing access to clean water for millions of people in the world. How can I feel comfortable encouraging black boys to pursue a career seeking to provide clean water for millions around the world, but not concerned about provide clean water to *them* as citizens in the richest country in the world? I think the potential for engineering to be inclusive and profitable for black boys is enormous, but the prospect of the necessary transformation occurring looks bleak.

Beyond emphasizing the historic exclusion of black males in engineering, with this project I also attempted to make a case for increased efforts toward bridging the gap between research and practice. Enacting community-engaged scholarship is one method of closing this

gap, but it is not the only solution. In one sense, this means K-12 engineering educators need to find a way to gain an authentic understanding of the needs, cultural practices, and interests of the students they desire to attract and prepare. I attempted to accentuate this need for black boys with the section headings for chapters five and six. As I reviewed the data and themes, I tried to creatively label in section in a manner that described what the data revealed while simultaneously promoting the idea that increasing the representation of black males in engineering (and other minoritized groups) is about more than engineering content. For example, in chapter one I have a section titled "Context Matters," but chapter four is entitled "Context is Everything." The amplification of context occurred because I knew that the sociopolitical context in which we live is important to our lives, but after reviewing my data I realized the contexts in which these boys (and all of us) live determined just about everything concerning their lives. Where they lived, who they watched and were influenced by, what they wanted to do, etc. are all based on the ecological circumstances around them. In another sense, this means developing appropriate mechanisms for disseminating curricula, assessments, and the latest scholarship to teachers and educators not trained in engineering but providing instruction on engineering content. In my experience, I have witnessed a lot of engineering programs and activities in action and very few provide the students with any legitimate skills or content knowledge that can be built upon. How can the engineering community ensure that under-resourced communities are not further disadvantaged by superficial engineering educational experiences? In my view, these are pertinent questions to actualizing the mission of those interested in making engineering accessible and inclusive for all people.

In regard to my actual research questions, it may be necessary to directly address them and provide specific recommendations for educators interested in promoting and advancing the

equitable inclusion of black boys in K-12 engineering education. I may use some data that has already been referenced in previous chapters, but the purpose to provide direct links to my research questions and the data I used to answer them. Research Question 1 asks *How does being a black male engineering educator offer insights about teaching engineering to black boys?* What I discovered was that this question is a bit misleading, just being a black male engineering educator does not necessarily give me any particular perspective, rather it was the various aspects of my identity and past experiences that have shaped what I believe it means to be a black man and my responsibility when teaching engineering that offers insights about teaching engineering to black boys. I am a Christian that endorses Black Liberation Theology (BLT), which essentially seeks to understand how to apply biblical principles to the issues black people experiences. BLT has an orientation toward pursuing justice and restoring the understanding of every individual's dignity and value, these beliefs shaped my advocacy for equity and not just equality, and my emphasis on explicating the systemic injustices (past and present) that have contributed to the condition of black Americans, instead of giving any mention of ideas for rugged individualism. I was born and raised in Detroit which, through self-reflection and intentional exploration, exposed me to the politics of race in America. Most neighborhoods in Detroit can be considered urban ghettos, and I began to wonder how the city reached this point, why haven't the numerous government-ordered interventions been successful, how does the popular perceptions of Detroit align with my lived experience, these inquiries led me to uncover the broader consequences of being black in America and the state-sanctioned intentionality of our misfortune. I attended predominantly white (private) high school which was my first time regularly engaging white people and being a racial minority in an educational setting. I grew up in a single-mother household, but I spent some days/weekends with my father periodically, so I

had a nuanced relationship with father and many other male influences throughout my life, and I haven't seen this type of circumstance studied in literature on black male development. I have acquired two engineering degrees, so I have witnessed healthy environments that promote black male success in engineering, and the contrasts between the universities I've attended have provided diverse experiences in my engineering learning. During my undergraduate studies the class sizes were small, and professors emphasized communal learning and gaining a deep understanding of subject matter, whereas, during my master's pursuit class sizes were twice as big with professors emphasizing independent study and gaining a breadth of material familiarity (without a good balance of depth). These differences were in part due to attending a small institution for undergraduate study and a large university for advanced study, but I believe there was also intentional decisions made to shape a pedagogical culture that prioritized efficient teaching rather than effective teaching. In teaching myself, I had to discover that these concepts (effectiveness/efficiency) are in conflict and determined a depth of understanding and solid foundation is most important for teaching black boys engineering. Studying the black male experience in United States has also shaped my perspective by giving me a research-based paradigm for thinking about black boys. This scholarship helped me discard stereotypes and myths promulgated about the abilities of black boys, and the circumstances that have precipitated the low performance and criminalization of black boys so many discuss now. Furthermore, I learned of effective measures that have documented success in advancing the intellectual and socioemotional development of black boys.

In Research Question 1a I was trying to uncover *How do I conceptualize engineering and its value for black boys?* One excerpt from my teacher/researcher journal was critical to unpacking my own thinking on this topic.

*"I did not necessarily set out to debunk myths or clarify misconceptions, rather, I was seeking to build-up black boys, expose and encourage them, plant seeds of knowledge. My desire was/is not to change them, but to enrich them. The systems in which they exist need change, and then their greatest potential would be more accessible, but in the meantime, I wanted to introduce tools to help them navigate current systems (e.g., school, law enforcement) successfully.*
*Success meaning staying alive (though out of their control), avoiding or reducing self-defeating behavior, establishing healthy self-identity (racial and masculine), developing political awareness, working toward justice, understanding communal responsibility, and so many other things."* [excerpt from my teacher/researcher journal, 4/21/18]

These statements may seem to be unrelated to teaching engineering, but as I have previously conferred, context is everything. Our national context deems black boys intellectually deficient and prone to violence, so engineering's value is tied to its ability to help them succeed in such circumstances.

In Research Question 1b I asked *How do I attempt to address the gaps between black culture and engineering culture (i.e., its pedagogy and practice)?* My lesson plans revealed multiple methods I used to address this disconnect, though all were primarily focused on helping the boys identify with engineering. One activity is a game which displays a headshot of an individual, I encourage the students to guess which of the photos show an engineer (or have an engineering degree). Each of the photos display a black male but vary in the man's attire and photographed activity. This activity allows the boys to see themselves (as black males) in engineering since most media depictions of engineers are white men, we also discuss whether each man has a college degree (undergraduate or advanced) and their engineering discipline. The diverse images and profiles are meant to communicate the diverse ways the boys could employ

their skills and interests in engineering. Another activity I used to address RQ1b is having the boys label a blank image with their own skills and positive attributes. This activity is used to help build self-awareness and racial pride. Thirdly, I facilitated the "Make An Engineer" activity developed by Purdue's For All a Chance to Engineer research laboratory (FACElab), this exercise allows the boys to create their own engineering figurine based on their selection of hobbies, community problems, and critical thinking concepts (Hynes et al., 2018). The underrepresentation of black males in engineering may cause black boys to think they cannot be successful in engineering, this combination of activities allowed the boys to visualize themselves acting as engineering with their own cultural values, beliefs, and expressions, as opposed to thinking about what things they have to set aside or expunge as a compromise to acculturation into the engineering community.

The second set of research questions concentrated on my identity as a researcher and the ways I sought to deepen the relevancy of my scholarship by exploring its applications to the lives of the students. Research Question 2 queried *In what ways does being a black male community-engaged scholar inform the way I teach engineering?* What I gathered can be summarized in to this, in the community classroom every moment is a potential teachable/learnable moment, and the more time you spend in that space the easier it becomes to identify ways to help the students develop a continuity between their learning in the academic and community classrooms. For me this is a powerful revelation because spending time with students outside the classroom and even residing in proximity to the students we teach can be viewed as unsafe or useless for those whose students live in urban impoverished communities. The concerns of these educators present an interesting conundrum, how can the circumstances students navigate be of little importance if

they're important enough for the teachers of these students to decide not to live in those same communities.

Regular engagement in the community also provides opportunities to learn more about students and see them in a more comprehensive manner than what we see of them in the academic setting. For some educators it may be difficult to imagine students behaving in any other fashion than what we directly see, but with the limitations of the school environment we only get a limited view. One excerpt from my teacher/researcher journal shares a good example of what educators can miss by only interacting with students in an academic setting.

*Before CSS [class session 5] I purposely arrived early to see if any of the boys would be outside playing basketball, and gauge whether I would have to knock on doors again to remind students about the class. Two of the boys were by the court, one noticed I had a Detroit Lions shirt on and stated that's his mom's hometown (which I knew already), I then asked them where they are from. One [the boy with the Lions shirt] said he's from an urban city in Tennessee and the other is from an urban city in Illinois. During my four years in Lafayette, I have noticed a significant number of black residents have migrated from a large urban city in Illinois, usually they cite Lafayette is safer and has better schools. I asked the boys which city they liked best and both stated Lafayette is much better than their native city, I asked why, they said it was a lot of violence where they come from and they even kill kids. As usual, I asked the boys whose fault is it that the cities are so violent, they said the people there, I asked what is the solution, they said leave, that's the only option. I asked what will happen to the people who cannot leave, they had no answer. That was not necessarily surprising, but the boy from Tennessee said his father is considering returning to their hometown, and though earlier in the conversation he said he didn't want to go back he said he'd go back with his dad. He*

*currently does not live with his father, and according to his mother his father doesn't want anything to do with him or his siblings. Yet, he clearly displayed a longing to be with his father, to what extent does this inconsistency [read: disconnect] impact his attitude and behavior?* [my teacher/researcher journal, 5/9/18]

This short recollection provided tremendous insight into the difficulties both young men were experiencing, and the burden being carried by the young man from Tennessee. Following that interaction, my engagement with both of the boys changed. I did not lower my expectations for their presence or performance in the course, but I was more attentive and attempted to be more patient with behaviors they exhibited that may have been disruptive or nonsensical.

For Research Question 2a which explored *What strategies and activities did I develop and implement to assist black boys' practice using engineering design and engineering thinking to address structural inequalities (i.e., racial prejudice, inadequate school resources and training)?* I noticed my primary strategy/activity was using a tool I created that connects the engineering habits of mind with (1) any hobby or recreational activity of the boys and (2) civic engagement. This activity uses knowledge transfer to assist relatability of the content and deepen the boys' understanding. As shown in Figure 7, I use a chart allow the boys to describe the understanding of the eHOM concept as defined in engineering, then give an example of how that concept can be demonstrated in an area of their interest (e.g., sports, music, writing), and lastly, they list how that concept can be applied in solving a community issue. I model the process myself and then encourage them to provide their own examples.

| eHOM | Engineering | Biking |
|---|---|---|
| Systems Thinking | Seeing how things work together | Understanding the bike: wheels, brakes, pedals, chain |
| Communication | Learn values of all people | Fitness, social, relaxing, adventure |

Figure 7: Abbreviated Engineering Thinking Across Diverse Contexts chart

During the class, students used this chart to think about how the concepts of systems thinking and communication can be used to address problems like homelessness, gang violence, and police brutality.

The final research question, Research Question 2b was about determining *What value (e.g., as educator, for community) is added through regular extracurricular activities (e.g., volunteerism, church) in the community of the students?* In this project, extracurricular activities in the community was very advantageous in building relationships with the boys' parents. As exemplified in the following excerpt, being present in the community classroom helps build trust with parents and can lead to establishing a supportive interaction where parents feel empowered in assisting the intellectual development of their boys.

After class I spoke with a couple parents of boys that had been severely absent, in one case the mother simply apologized and stated she is exhausted after work and forgets to bring the boys, the other mother said her son had baseball practice. The mothers expressed that they still believed the class is/was beneficial experience for the boys and how they wished it lasted longer. We spoke for about 40 mins on topics ranging from allowing the boys to speak openly, to ways to help them study and learn, to how some of the boys wanted to return to their original hometowns, but the mothers think Lafayette is safer and has better

*schools. The conversation re-affirmed the value of the class, but it also re-affirmed my belief that black parents do care about the education of their children contrary to popular belief. I wouldn't say it's most important, at least not if measured by their actions, but it is indeed of value. However, many, because they themselves did not receive a high-quality schooling experience and do not pursue academic learning on their own, do not know how to assist the academic developmental process for their children. They need educators to assist them in understanding the things they need to do to help their children's learning, though this information sharing must be done with compassion, grace, and understanding of the parents' circumstances. Often, they are dealing with many other stressors, they have the same community issues the boys expressed, and other adult responsibilities to manage which may prevent their effective engagement with their child's learning and development.* [my teacher/researcher journal, 5/23/18]

This experience increased my comfort and confidence in the service I was provided, and it built rapport with the parents to let them know I was willing to listen and engage them, and that I am deeply concerned for the well-being of their boys.

My primary takeaways from this research are (1) Studying my own identity formation was helpful in understanding the way I teach black boys. Self-study can be an underestimated tool for teaching more effectively, we may feel that we already know ourselves well, and even if that be true we may not be as aware of how our ideas, culture, and worldview influences our interactions with others. (2) Teaching engineering is not just about teaching engineering. I always thought this to be true for me, but now I believe this to be true for any engineering educator. Engineering educators must be aware of the ways the technocentricity of engineering (Riley, 2008), its proclamations of objectivity and depoliticization (Cech, 2014), and use of math

and science as gatekeeping subject matter (Sheppard et al., 2009) disenfranchise people of color, people of low socioeconomic status, and especially the hyper-marginalized. Engineering Educators must also be aware of and be willing to expose their students to (not just their black students), the abundant contributions of black people (and people of color) to the progression of engineering industry and theory. These aspects of teaching are particularly important in engineering because of the great social capital engineers have (Riley, 2008), which initiates great social responsibility. (3) Community engagement builds rich/deep connections to students and their caretakers. It certainly is a sacrifice to spend more time than already given trying to serve and connect with students, but the "payoff" is invaluable and mutual. I have recommendations for K-12 engineering educators who teach black boys as well, based on my findings doing this work: (A) Educators of black boys must understand and become able to skillfully inspire black boys. Challenge them to consider other skills/talents/interests they have (beyond athletics), encourage them to have vision beyond what they see now, train them to have the courage to step into places/experiences they have not had before. (B) Educators of black boys must be willing to investigate how they are experiencing our presence and our teaching, separately in fact. (C) Educators of black boys must build healthy relationships with their parent(s)/guardian(s). From an ecological systems perspective building trust and connectivity with the caretaker(s) of black boys is perhaps the most advantageous way to support/promote their learning and development. (D) Educators of black boys must identify and scrutinize their biases. Especially if they tend to think negatively in situations involving black boys that they do not when the race/gender of the student is different.

Finally, as I close I want to reiterate that in a racialized society we must take seriously the consequences of racial injustice, past and present. I believe the purpose of education should be

full civic participation, but as long as black citizens are treated as second-class residents of this country no one can truly realize the fullness of their humanity. Expunging racism and white supremacy is an active process, requiring counter-activity at every level of society. The way we teach, the materials we use and the atmosphere we provide can be anti-racist and all-inclusive spaces where students can learn to be comfortable in our classroom and learn to better navigate the environment outside the classroom. It is important for educators to be mindful of the power we have to empower and liberate the minds of our students. However, we must realize what is actually going on before we can effectively deal with it.

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