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EXPLORING THE EXPERIENCES OF AFRICAN AMERICAN MIDDLE SCHOOL
STEM TEACHERS

A Dissertation

by

STEPHEN J. MINTER

Submitted to the Office of Graduate Studies
of Prairie View A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2024

Major Subject: Educational Leadership

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May 2024

Major Subject: Educational Leadership

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Exploring the Experiences of African American Middle School STEM Teachers

Stephen J. Minter

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ABSTRACT

Exploring the Experiences of African American Middle School

STEM Teachers

Student Name and Undergraduate Degree and Institution

(May 2024)

Graduate Degree and Institution

Chair of Dissertation Committee: Fred Bonner

As society is continuously in a space of changing politics and social structure, the educational landscape continues to be plagued by several inconvenient truths for African American educators. One truth is the lack of representation of African American teachers in science, technology, engineering, and math (STEM) areas. In a 2016 USDE report titled *The State of Racial Diversity in the Educator*, the report indicated that in the 2011-2012 school year, White educators made up 82% of the teachers in the nation.

Teachers often bring their life experiences, cultures and ideologies into their classrooms and campuses painting them with their assumptions of how they define *good educators*. Most importantly, teachers bring their racial identity to the workplace. The intent of this study was to focus on the intersectionality between race and professional identity to give voice to the experiences of African Americans and how they influence their identity as STEM educators. This study chose to focus on racial identity influenced STEM teacher performance in the middle school classroom.

This qualitative multisite case study explored two middle school campuses and interviewed teachers from both campuses. Case study, in tandem with narrative inquiry,

served as my theoretical approach for this exploration. Case study was used to compare and potentially replicate the findings to draw cross-case conclusions from the information collected (Yin, 2017). Based on the findings, I concluded that educators must understand the various multidimensional components of their identity like race, social categories, personal traits and values, and life experiences, that influence their success as middle school STEM teachers. Within the findings it was made clear by each participant that race in correlation to their role as STEM teachers was the leading identity factor which led to their success.

Keywords: teacher identity, critical race theory and teacher identity, ecological systems, teacher identity and STEM, intersectionality

DEDICATION

This dissertation is dedicated to the young boy from the south side of Chicago who always knew he was different and always wanted more for himself despite his surroundings and the doubts that have come his way. I am proud of you and I am pleased to continue to follow you on your journey throughout life.

ACKNOWLEDGMENTS

The road to obtaining a doctorate was not easy but I did not go through this journey alone. I would like to acknowledge my mother, Stephanie Minter-Smith and my aunt, Monique Minter and the rest of my amazing family who offered support throughout this process. I would like to thank all my friends. My childhood friends, my high school friends, my college friends, and finally my H-Town family that I have made here.

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TABLE OF CONTENTS

	Page
ABSTRACT.....	iii
DEDICATION.....	v
ACKNOWLEDGMENTS.....	vi
TABLE OF CONTENTS.....	vii
LIST OF FIGURES.....	x
LIST OF TABLES.....	xi
CHAPTER	
I INTRODUCTION.....	1
Overview/Background.....	1
Background to the Problem.....	2
Purpose of the Study.....	3
Methodological Approach.....	3
Conceptual Framework.....	4
Critical Race Theory.....	4
Identity Theory.....	4
Positionality.....	5
Operational Terms and Definitions.....	6
Organization of Study.....	8
II LITERATURE REVIEW.....	9
Identity.....	9
Identity Theory.....	11
Core Concepts in Identity Theory.....	12
Erikson’s Stages of Identity Development.....	17
STEM Identity.....	25
Expert Blind Spot.....	27
Expert Blind Spot and STEM Integration.....	28
Expert Blind Spot and STEM Interest/Identity Stories.....	29
Critical Race Theory.....	30
Working Definition of Critical Race Theory.....	36
National Presence of Critical Race Theory.....	38
Critical Race Theory in Education.....	40

Critical Race Theory and Educational Research	41
Critical Race Theory and Studying Black Teachers	45
Personal Voices.....	46
Decline in the Number of Black Teachers.....	48
Ecological Systems Theory (EST)	50
Microsystem.....	52
Mesosystem.....	53
Exosystem	54
Macrosystem	54
Chronosystem	55
Process-Person-Context-Time Model.....	55
Presuppositions	56
Strengths of EST	58
Criticism of EST	60
 III METHODOLOGY	 61
Method	61
Theoretical Approach.....	62
Case Study	64
Sampling Techniques	65
Participants	65
Site Selection.....	67
Gatekeeping and Recruitment Strategy.....	68
Dealing with Sensitive Topic	69
Researcher’s Role Management.....	69
Ethical Consideration	70
Reciprocity	71
Data Collection Methods.....	71
Interviews.....	72
Teacher Demographic Form	73
Journaling.....	73
Observations	73
Informal Conversations.....	74
Data Analysis Steps.....	75
Content Analysis.....	75
Coding.....	76
Conceptually Clustered Matrix	78
Assuring Trustworthiness, Credibility and Bias	79
Chapter Summary.....	82
 IV FINDINGS.....	 83
Description of Participants.....	84
Data Analysis	85

Themes	91
Chapter Summary.....	111
V DISCUSSION AND CONCLUSIONS	113
Relation to Conceptual Framework.....	114
Relation to Research Question	123
Recommendations for Practice.....	130
Implications for Future Research	134
Summary and Conclusion	135
REFERENCES	137
CURRICULUM VITAE.....	Error! Bookmark not defined.

LIST OF FIGURES

FIGURE	Page
Figure 1: Conceptual Framework	5
Figure 2: Implications for Future Research	135

LIST OF TABLES

TABLE	Page
Table 1: Campus Purple.....	67
Table 2: Campus Blue.....	68
Table 3: Participant Demographics.....	84
Table 4: Themes.....	87

CHAPTER I

INTRODUCTION

Overview/Background

As the world is continuously in a space of changing politics and social structure, the educational landscapes continue to be plagued by several inconvenient truths for African American educators. One truth is the lack of representation of African American teachers in science, technology, engineering, and math (STEM) areas. In a 2016 USDE report titled *The State of Racial Diversity in the Educator*, it was indicated that in the 2011-2012 school year, White educators made up 82% of the teachers in the nation.

Given this data, there is no surprise that the overrepresentation of White educators is creating a major gap among STEM teachers. *Teacher Diversity and Student Success* (Hansen & Lindsay, 2021), *A Little Guide for Teachers: Diversity in School* (Kara, 2020), and *Teaching to Diversity: The Three-Block Model of Universal Design for Learning* (Katz, 2012) are included as part of the extensive literature focusing on teacher diversity. In addition, a study completed by Carver-Thomas (2018) found that African American teachers represented a declining share of the teacher force. Black teachers decreased by eight percent as members of the teaching workforce in 1997 to a total representation of just more than six and a half percent in 2015. For this research, the terms Black and African American are used interchangeably.

This dissertation follows the *Publication Manual of the American Psychological Association, 7th Edition*.

STEM education places an emphasis on innovation, problem-solving, and critical thinking, which are key skills necessary to thrive in a fast-growing industry (NCES, 2016). Being a STEM teacher is important as these educators can help develop skills in students that make them employable and ready to meet the strict demands of the current labor market. STEM teachers expound on each component of the term by teaching students to enhance problem solving skills, analyzing information, making conscious decisions, and preparing students to work in a high-tech environment. Thus, STEM teachers are highly effective and appreciated in society and the world of education. However, research from Willoughby (2023), Ferguson (2017), Schwartz (2019) and more shown light on the importance of a diverse teacher workforce.

Background to the Problem

Literature such as Stylker (1980) and Rosenberg (1979) suggested that identity construction was a matter of curating a personal sense of the world in tandem with improving their understanding of how educators saw themselves interacting with their peers and role models. Teachers often bring their life experiences, cultures and ideologies into their classrooms and campuses painting them with their assumptions of what they believe a good educator is. Most importantly, teachers bring their racial identity to the workplace. The teacher's workforce is majority White, and while that is not reflective of the evolving student demographics or the historical racial academic achievement gap, it warrants questioning whether racial identity impacts the success of those in teaching roles and the success of students (Villegas & Irvine, 2010)

Purpose of the Study

When examining the experiences of African American STEM teachers, the literature is often centered on issues of gender pay inequalities, or the struggles of a specific gender in relation to their teaching career path. This emphasis disregards the significance of the relationship among the key components of one's identity. The intent of this study was to focus on the intersectionality between race and professional identity to give voice to the experiences of African Americans and how their experiences influenced their identity as STEM educators. Rather than focusing on the intersection of race and gender, this study aimed to expand the discourse by examining key components of the participant's identity and the impact that navigating these intersecting identities had on their contribution to education particularly in the classroom. This study explored how one's experiences as an African American influenced identity among middle school, that is sixth to eighth grade, STEM educators.

Methodological Approach

A qualitative approach for this study was chosen because I am motivated by the quality and complexity that qualitative inquiry promotes to the field of education, specifically, its suitability to my study of African American STEM teachers and the significance of race on their professional experiences. Qualitative research is a way of thinking about a topic and asking questions to gain more insight (Hesse-Biber & Leavy, 2011). Qualitative research allowed me, as a researcher, to provide participants with a voice. I am aware that my role as a researcher is to balance my own understanding of how experiences reflect and influence perspectives of other experiences. Therefore, the

instinctive journey that is taken in qualitative research is vital to the continuing interpretation of others lived experiences (Clandinin & Murphy, 2009).

Conceptual Framework

Critical Race Theory

Dialogue of race and education happens often, however the conversations of racism and the impact on the educational systems are not as frequent. The Critical Race Theory (CRT) movement is backed by scholars and researchers interested in studying and changing the relationship amongst race, racism, and power (Delgado & Stefancic, 2001). In an article by Ladson-Billings and Tate (1995), the authors explained how CRT, as a conceptual framework, could be applied to the understanding of educational inequalities. In Chapter II, there is further exploration of the theory's guiding tenants and the significance of the framework in relation to this study.

Identity Theory

Identity is a complex concept that is constantly changing. Identity is generally defined as who or what someone is, in addition to the various interpretations people attach to themselves or the meanings attributed by them (Beijaard et al., 2000). Given this definition, it is understood that teachers are consistently engaging in the self-creation process, not only in the context of their professional roles but other roles they have in life as well.

Teacher Professional Identity. The literature on teacher identity is growing as a topical focus and becoming more prevalent in research given the national shortage of educators. Watson (2006) argued that teacher identity was viewed as a teacher's sense of

self, which included one's personal, professional, and cultural dimensions. Other definitions and components of the teacher identity framework are explored in Chapter II.

Ecological Systems Theory. The Ecological Systems Theory is symbolic of a convergence of biological, psychological, and social sciences. Within this theory, researchers made it their duty to explain and offer understanding regarding the ways in which one interacts with multiple interrelated systems within their environment (Bronfenbrenner, 1983). Chapter II provides a more in-depth look this theory and Chapters IV and V discuss the theory's connection to the current body of research. Figure 1 is an illustration of the conceptual framework.

Figure 1: Conceptual Framework



Positionality

I have always felt a strong personal and mental pull to what makes us different and how those differences play into our everyday functioning, including our professions.

From the initial stages of this research and working in education, I have learned that identity theories can provide researchers with access to knowledge necessary for understanding how individuals transform based off their experiences. Working at a low performing campus in an urban setting, I interacted and became friends with many teachers who were Black. Working in this setting expanded my knowledge of the African American teacher experience. The teachers all had different facets that their identity was comprised of, however, race was the only facet that they all had in common. From working there, I knew that within the campus community, the realization that race made them all equal, in a professional sense, silenced other identity facets. Ultimately it made me want to explore the conversation of teaching but through the lens of their race.

Operational Terms and Definitions

This section serves as a brief explanation of terms used to enhance readers understanding of the study.

African American: a person of African ancestry who has been socialized within the Western context of the United States (Evans, 2019). African American and Black are used interchangeably for the purpose of this research.

Bridging Identity: an identity type that makes connections between past biographical experiences and one's professional role. As it relates to teacher identity, the concept of bridging focuses on how past biographical identities contribute to ways the teacher defines their professional role considering their minority background (Galindo, 1996).

Critical Narrative Study: a comprehensive qualitative approach bounded in context where retrieved data illustrates storied knowledge of study participants. A critical lens is used in this narrative, Critical Race Theory (Clandinin, 2007).

First-order Narratives: narratives have been defined as first and second order (Carr & Klassen, 1997). First order narratives refer to an individual telling the stories of themselves or about themselves. Second order narrative consists of the researcher's account of stories used to present explanations of social knowledge which can also be labeled as a representational narrative (Somers & Gibson, 1994).

Identity: ways in which one describes themselves, as well as what it means to be a certain kind of person (Gee, 2000). Identity includes elements assigned at birth, in performances, and through the ways in which people behave in various contexts.

Role models: a person who inspires and fosters growth in others to strive for greatness. They are also someone who is admired and someone who others aspire to be like (Goings & Bianco, 2016).

STEM: Science, technology, engineering, and mathematics (National Academies of Sciences, Engineering and Medicine (2019).

Teacher Identity: Dewey (1938) used an individual's experience as a central lens for understanding a person and the keys to educational experience as a focal point for the principle of interaction and continuity. He believed to understand a teacher's identity, there must be an understanding of the teacher's life. Expanding on Dewey's theory of experience and education in relation to teacher identity, Connelly and Clandinin (1999) approached the topic of teacher identity through the lens of teacher's encounters

suggesting that identities were composed and improvised as life progressed. This ultimately implies the claim that stories and experiences are the narrative terms of who people are in the world.

Urban School: schools that are located within major metropolitan cities, usually greater than 250,000 persons. They house students of various cultural and linguistic backgrounds and 65% of the student population is mainly Blacks, Latinos, Pacific Islanders and Asians (NCES, 2016).

Organization of Study

Chapter I presented the problem statement, the purpose of the study, the research questions, the conceptual frameworks of the study, the significance of the study, and the researcher's role in the study. The opening chapter also included operational definition of terms. Chapter II presents a review of the literature relevant to the problem. Chapter III describes the methodology used in the study, including the research design and data collection and analysis processes. Chapter IV presents the findings and the final chapter. Chapter V presents the conclusion and recommendations for future research.

CHAPTER II

LITERATURE REVIEW

Considering the importance of the African American STEM teachers and the different dimensions that lead to their success, it is crucial to examine the complexities of middle school African American STEM educators. To frame this study, it is imperative to examine the guiding frameworks of Critical Race Theory (Bell, 1980), Identity Theory (Freud, 1923), Teacher Identity Theory (Watson, 2006), and Ecological Systems Theory (Bronfenbrenner, 1983). The purpose of this literature review is to provide a conceptual understanding of the complex entities that helps one understand how African American STEM teachers construct their identity and those experiences that shape their success as educators.

This literature review also illustrates the linkages among Intersectionality (Crenshaw, 2016), African American identity development and culturally specific pedagogy in relation to the African American middle school STEM teacher experience. To understand the multidimensions of African Americans and the experiences that shape their identity and professional identity, this literature review begins with an exploration of identity theory and the constructs that are at its foundation. This is vital for this study because it will help in offering context to the functioning of African American educators in the middle and public-school sector.

Identity

This literature review begins with exploring the origins of identity because there must be an understanding of the concept before expanding on the theoretical frameworks

of intersectionality and Teacher Identity Theory. Identity theory was first articulated by Freud (1923) as he claimed that one's identity connected with their personal values with their history. This initial idea led to further conversations which began to connect one's identity to social, emotional, and cognitive growth as it was clear in various literature by Marcia (1980) and Erickson (1959).

The research performed by Erickson (1959) and Marica (1980) placed identity as progression of stages needing a solution. Most theories and sub theories of identity address specific elements of an individual's identity. They usually offer an outlook that is so simplified, it does not address the complexities that relate to identity construction and development (Reynolds & Pope, 1991).

Identity Theory also owes much of the early efforts of its development to George Mead, who created the foundation for what would become symbolic interactionism (Mead, 1934). Symbolic interactionism is the framework that views social interaction as symbols that people communicate to each other. Identity theory follows this fundamental premise of symbolic interactionism (Burke, 1980; Stryker 1980). Identity theorists do not utilize the entirety of Mead's work. Theorists utilize the more pertinent components of his work in tandem with the findings from other theorists such as William James and Charles Horton Cooley, amongst others (Burke & Stets, 2009).

There are four concepts that identity theorists have considered from Mead's early theory of self: (a) Mead's concept of "mind;" (b) Mead's understanding of "self;" (c) Mead's distinction between "signs" and "symbols;" and (d) Mead's concept of significant gestures. Each are elaborated: (a) mind: a person's consciousness of themselves in a

situation where that person will think about themselves as an object behaving in a situation that is motivated by some goal. Also, in this situation, they may adjust their behaviors in ways to achieve the end goal. Ultimately to have a mind indicates there is a capacity to reflect upon oneself as an object no different than another one in each social environment. Identity theorists believe people only act in a certain way to achieve an end state (Burke & Stets, 2009); (b) self: this component consists of two parts “I” and “Me.” The “I” is the goal seeking agent that compels the self to act to meet its desires. The “me” learns to orient the self by adopting a basic understanding of the cultural knowledge of society. Simply put, the “me” orients itself in ways that reflect the views of the universal other (Mead, 1934); (c) signs and symbols: a sign is a situational provocation that incites a response in individuals. Symbols are a social consensus that defines the appropriate responses to situational stimuli; (d) gestures: symbolic acts that take place during social interaction to provoke a response. Mead (1934) claimed that gestures were a three-step process. First, there must be an initial gesture. Next, another person interprets the gesture. Lastly, that person responds to the initial gesture. Moreover, gestures are usually only meaningful when they can stimulate a response in others that was intended by the initial gesture. The incorporation of these concepts by Mead and other theorists are important to the body of literature surrounding identity theory and will be significant to this research.

Identity Theory

Stryker (1980) and Burke (1980) have been incredibly influential in the development of Identity Theory. Stryker is best known for his introduction of identity salience. This concept explores the importance of an identity relative to other identities.

Identity salience influences how individuals act in each situation. The concept argues that the higher the salience of an identity, the greater the probability that actions will agree with the expectations that are connected to that identity (Stryker & Burke, 2000).

Burke was also a prominent figure in the development of Identity Theory. His work focused on the internal dynamics of self-processes and introduced a cybernetics model of control to describe the association between identity and behavior. According to cybernetics model, identities and their accompanying expectations serve as the standard of reference for behavior. When an identity is stimulated in a situation that requires it, self-relevant meanings from the occurrence are compared to the predicted meanings associated with the identity. Identity is the meaning one's attributes to the self as to who one is in addition to providing a layout for individual behaviors (Burke & Reitzes, 1981).

Core Concepts in Identity Theory

The following sections describe what are often referred to as the core concepts of Identity Theory (Stets & Serpe, 2013). These core concepts include social structure, identities, identity prominence, identity salience, identity commitment, identity verification, and resources in identity theory. Each of these concepts play a major role in the curation of one's identity which is why it is important to understand each of these concepts.

Social structure. As previously mentioned, identity theory developed from the symbolic interactionist framework (Stryker, 1980). Stryker (1980), who was greatly influenced by Mead (1934), contended that society shapes self, and self-shapes society. Identity theorists conceptualize three types of social structures: large, intermediate, and

proximate social structures (Hunt et al, 2005). Large social structures drive as systems of social stratification and organize people based on various external and internal diversity features (Blau, 1977). Large structures also create boundaries that enhance the likelihood of people in certain social positions forming relationships with one another.

Intermediate social structures are composed of localized social affiliation networks including but not limited to communities, neighborhoods, schools, or workplaces that influence the styles of social relationships people curate. Intermediate social structures bring large numbers of people together in one setting. This increases the likelihood of forming relational ties to each other. Hence, large social structures generate boundaries to interactions, and intermediate social structures facilitate interactivity (Malacarne, 2017).

Proximal social structures represent everyday interpersonal interaction and offer contexts within which persons can embrace and utilize identities and foster social relationships (Merolla, 2012; Serpe, 2019). These interactions occur among family members, friends, coworkers, and such. It has been argued that identity theorists believe that proximate social structure is where identity prominence comes to life (Aldecoa, 2019). Proximate social structures are viewed as social networks in which people share comparable identities.

Identities. Identities are a set of meanings that are used to define people. Meanings are mediational response to stimuli (Burke & Stets, 2009). Meanings that define people in identities are called identity meanings and identity meanings act as a spur for further action. Given this, meanings define who one is in an identity and provide

the drive to control perceptions of oneself, so they are steady with these identity meanings. Identity theorists state there are various types of identities including but not limited to social identities, group identities, role identities, and person identities (Burke & Stets, 2009).

Social identities are meanings people use to define who they are as it pertains to social categories such as their political affiliation, ethnicity, and religion. A social category stratifies people in society and their social rank determines how they are treated by others. The social identity concept aligns people's response to situations in relation to the attitudes and values of social categories.

Group identities are meanings that develop in interaction to define people's relation to their group members including families, friendships, and religious communities. Given the factor of interaction, that is what makes the group identity different from the social identity. Social identities emerge from a progression of a grouping or self-categorization whereas group identities come about as meanings become shared amongst people during social interactions.

Role identities are the meanings that are connected to a person's role in society. This identity role guides people's perceptions in social roles correlated with their corresponding meaning. Aligning one's perception with the meaning of role identities grants one with feeling of being competent in such role.

Personal identities are the meanings associated with the distinct qualities or features that distinguish people from others. Identity theorists' debate that since meaning of being moral or dominant are culturally collective, people can draw upon these

meanings to emphasize not only their identities but other identities as well (Aldecoa, 2019). While the sub concept of social identities has been explained it is important to also learn the concepts of identity prominence.

Identity prominence. Identity prominence is defined as how important an identity is to someone Rosenberg (1979). Prominent identity types are representative of one's core values and desires. Within the context of identity theory, identity prominence is organized in a prominence hierarchy. The more prominent an identity or the higher it is positioned the more likely that person will invoke in various social situations (McCall & Simmons, 1978). Stryker (2014) believed that there was evidence in identity theory to suggest that identity prominence influenced other major concepts within identity theory.

Identity salience. Identity salience is the probability that an identity will be activated across social situations (Stryker, 2002). The higher the salience of an identity the more likely it will be activated across situations. Stryker (2002) also argued that identities were arranged in terms of a rank ordering of identity salience. Those identities with a salience of a higher level were ranked above identities with a lower level of salience.

Identity commitment. Identity commitment is conceptualized in two ways within identity theory. Stryker (1980) argued that identity commitment was the cost incurred for not activating an identity. These costs refer to a person's social ties, such as the number of social ties they have, and the emotional bonds to those ties enhance the costliness of not activating the identity in social situations. On the other hand, Burke and Reitzes (1991) theorized identity commitment as one's motivation to verify an identity in

social situations. Burke and Reitzes (1991) proposed two bases of identity commitment: cognitive and socioemotional. Cognitive bases of commitment refer to the perceived social rewards and constructive emotions that a person receives in an identity. Socioemotional bases of commitment indicate the ties that someone forms while embedded in social networks. The verification a person may receive while interacting with social ties increases their identity commitment.

Identity verification. People are motivated to perceive a match between who they believe they are and how they feel when others see them in social situations. In identity theory, identity verification is conceptualized in terms of a perceptual control system (Burke, 1991). The perceptual control system is comprised of five key components: identity standard, perceptual input, comparator, emotions and output. When someone enters a social situation and perceives the meanings of the situation, their appropriate identity will then activate. When people perceive a discrepancy between identity meanings and situational meanings, this means that the identity has been non-verified. Identity nonverification takes place when an identity over or under-verifies. If identity non-verification continues over time, a person's identity meaning may shift in alignment with the context of the situation. This is a form of identity change (Burke, 2006).

Resources. Resources are anything that sustains the self and interaction within the social structure (Freese & Burke, 1994). This definition is more attentive to what resources can do as opposed to what they are (Serpe & Stets, 2013). Resources act to facilitate identity verification and sustain social interactions. Identity theorists have

identified three types of resources: structural, interpersonal, and personal resources (Cast & Stets 2007).

Structural resources like social status, prestige, or social, and economic capital provide people with social influence in their interactions. Structural resources orient how people interact with one another including but not limited to the dynamics of children with their parents or employees with their bosses. Interpersonal resources sustain systems of interactions by assisting in the verification of people's identities. Some examples of interpersonal resources are role-taking, social likeability, and trust (Cast & Stets, 2007). Thus, role taking, and trust are important in forming these types of social relationships. Personal resources are one's belief in themselves as authentic, competent, and worthwhile that enable the verification of their identities.

Erikson's Stages of Identity Development

The concept of identity and identity development was originally presented by Freud (1923) who titled it identity or inner identity. As he introduced the notion of individual and group identity to mediate conflict between himself and the Jewish community, Freud (1923) became one of the first to introduce the miscellaneous dynamics of personal development. Freud (1923) viewed identity as the integration of an individual within the group and how they learn to interact within that group. Using Freud's theory of ego development, psychosocial theorist Erik Erikson (1959) examined the concept of ego identity development.

Erikson's (1959) stage theory of identity development is rooted in the assumption that humans grow and progress through a set of phases. The first stage of identity

development, basic trust versus mistrust, is negotiated by newborns and infants. Erikson (1959) stated that basic trust is the cornerstone of a healthy personality. This is the stage where children are solely dependent upon adults and if the infant's needs are accommodated, the baby has the freedom to progress to the next level of development, autonomy versus shame and doubt.

The second stage of development is where the child is gaining more independence. The third stage of development is initiative versus guilt. This is the stage where children begin to find out who they are in relation to the people and the world around them (Erikson, 1959, 1968). The fourth stage is industry versus inferiority. This stage is where children start to integrate their social and cognitive experiences allowing them to discover the areas where they individually excel. The fifth stage of personality development by Erikson (1959) is identity versus identity diffusion.

Identity is a collection of comprehensive gains someone at the end of adolescence has derived from all the pre-adult experiences to be ready for the tasks and trials of adulthood (Erikson, 1959). Identity is who people are as individuals in addition to who they are as members within a group, and how they equip themselves to deal with their past, present and future experiences (Winsell, 1971). Even though identity is consistently shaped from the moment a child is born, identity is most prominently shaped and stabilized during late adolescence and the early years of adulthood (Chickering & Reisser, 1993; Wilson, 1978).

Late adolescence is arguably one of the most pivotal periods in one's life. This is the time when young adults begin to gain the competencies and skillsets required to

becoming fully functioning adults (Erikson, 1968). In some instances, adolescents are more inclined to find comfort within cliques but continual exposure to social challenges typically assist in progression toward healthy identity formation (Burt, 1998). During the identity stage of development, young adults are keen to wanting to be validated by their peers in tandem with being supported and inspired by their teachers and other adults who are influential to them (Hauser & Kasendorf, 1983). On the contrary, adolescents who do not feel supported or who feel deprived by their surroundings tend to lack development and are not expected to integrate into higher levels of adult development (Erikson, 1968).

There are three final stages of Erikson's Development Theory that focus solely on the adult years. Intimacy and distantiation versus self-absorption investigate the adult need to seek a life partner. The generativity versus stagnation centers on the ability and inclination of adult partners willingness to provide the environment for the establishment of the next generation.

The final stage, integrity versus despair and disgust, is where adults feel a notable sense of self-worth and integrity and are satisfied with their overall lifestyle choices. Ultimately Erikson (1959, 1968) believed that sequences of various experiences can lead to the foundation of one's identity. Sequences of inconsistencies and negative interactions lead to negative personality traits while positive experiences result in healthy identity characteristics.

Racial Identity

Racial identity refers to an individual's physical appearance and the social meaning assigned to that appearance based on historical events within society (Phinney,

2005). This definition of this concept implies that racial identity is dually influenced by factors both biological and social. Thinking back to the early 1900s, African Americans who were fairer in skin would often attempt and sometimes pass for White. It is important to note that during this period, social characteristics regarding sexuality and morality were negatively associated with anyone who appeared Black and had darker hues of skin (Gates, 2004).

Racial identity describes a notion of group identity that is rooted in an individual's perception that they share a common racial heritage with others (Gardner-Kitt & Worrell, 2006). The concept of racial identity represents a host of permanent biological characteristics that are categorized by various physical features including but not limited to skin color, hair texture, and ancestry origin. Kniffley (2013) confirmed that these characteristics are quantified by population measures where citizens are grouped into specific categories based on their race and ethnicity. Ultimately, racial identity focuses on responses to racism and the assessment of experiences that are directly connected to racism (Ong & Phinney, 2007).

Racial Identity v. Ethnic Identity. Research concerning racial identity has generated countless theories and operational definitions which sometimes can be contradictory (Chavous, et al, 1997). To simplify and accommodate these inconsistencies Chavous et al., (1997) developed the Multidimensional Model of Racial Identity (MMRI). MMRI poses race as one of African Americans many components and identities. MMRI offers four dimensions of racial identity. The four dimensions are (a) salience. Salience refers to the degree to which someone, at any point in time, considers

race a relevant part of their self-concept; (b) centrality, which represents the degree to which a person defines themselves with regard to race in a normative state; (c) ideology, a combination of the opinions, attitudes and beliefs one holds concerning the way they believe other people in their race should act; (d) regard, which emphasizes evaluative and affective judgment of a person's race (Sellers et al., 1997). For the purposes of the current research, centrality and ideology were measured because the extent to which an individual identifies with their racial group is hypothesized to be directly connected with the influence of their professional identity within the middle school classroom setting.

Too often there are misconceptions about the similarities and differences between racial and ethnic identity and researchers should make it their job to be clear in the type of identity they want to study (Helms, 2007). Ethnic identity concentrates on self-identification, whereas racial identity acknowledges an integration of the influences that social oppression through an antiracism paradigm highlights (Helms, 1990; Helms & Talleyrand, 1997). Some of the models that have addressed racial identity tend to lean more towards race while ethnic identity principals have several racial and ethnic group applications (Cross, 1971; Phinney, 1989). Ultimately racial identity research has been devoted to accounting for intergroup relations and analyzing social structures (Helms, 1990), while ethnic identity does not focus on those areas but more so other pertinent considerations (Phinney, 1996). Coakley (2005) stated that the importance of clearly identifying the distinction between the two constructs is because as a society, people do not treat race and ethnicity the same, therefore the two constructs should be stationed under their own identity. This study focused on racial identity but to offer an orientation

to racial identity, there is further review of African American racial identity and Black Identity since they are used interchangeably in the research and all the participants identified as one or the other.

Nigrescence Theory. William Cross developed Nigrescence theory in 1971. This theory is said to be the seminal Black racial Identity development model (Cross et al, 2002). When this theory was conceptualized, Cross referred to it as “an identity change process as a Negro-to-Black behavior conversion experience” (Cross, 1991, p. 189). Upon further development of the theory, Cross (1991) reconsidered the theory as a resocialization experience that promoted the transformation of preexisting identities such as non-Afrocentric identities to one that is Afrocentric. Nigrescence has since been interpreted as the developmental process of becoming Black (Benjamin et al., 2000).

Cross (1995) proposed a definition of racial identity that was set to include personal attributes that would transcend ethnicity, race, gender, culture and the cultural norms shared by a group of people. In his theorization, Cross (1995) made it clear that the development of racial identity was enabled through socialization. He compartmentalized identity formation into five stages: pre-counter, encounter, immersion-emersion, internalization, internalization-commitment.

In the pre-encounter stage one obtains attitudes that range from low salience to race neutrality to anti-Black (Cross, 1991). There is not a lot of emphasis given to race in this stage as it focuses more on other descriptive aspects including but not limited to occupation, lifestyle, and religion, as more salient. It is assumed people do not recognize race as something that affects their lives at this stage. There are Black people who take

great pride in their race while on the other hand, there are Black people who relish in their attitudes of anti-Blackness. Anti-Blacks loathe other Blacks as they feel alienated from them or do not identify with Blacks or the Black community or even so much as view them as sources of support (Cross, 1991). This stage of Nigrescence usually occurs when someone does not realize they have been raised with White westernized ideologies, given that it is deeply embedded in their culture.

The encounter stage is when people must work around, slip through, or dismantle the relevance of their ideology and worldview. Simultaneously, others must offer some hint of direction in which to point the person to be resocialized or converted (Cross, 1991). This stage is comprised of two steps, encounter and personalize. During the encounter step, an occurrence happens that shapes how one observes their race. Personalize occurs when someone acts because of the personal effect the event evoked on said person's world view. Cross (1991) made it clear that the encounter stage should not be negative for the experience to have impact and direct a person toward Nigrescence. The main goal of this stage is to allow significant impact to be the catalyst to incite change in one's thinking.

The immersion-emersion stage of Nigrescence addresses the most thrilling part of Black Identity development because it represents the vortex of psychological Nigrescence (Cross, 1991). During this stage Black people begin ridding themselves of their previous viewpoints and curate a new frame of reference with the new knowledge they have about race. There are not any definitive changes but there is commitment to change during this stage. Cross (1991) looked at immersion as a dominating sensation that is consistently

motivated by rage at White people and their culture, the guilt of having once been tricked into thinking Black ideas and extending one's sense of pride in their Black selves and Black culture. According to Cross et al. (2002), Black people can feel various emotions expressed in miscellaneous ways. Vandiver et al., (2002) also claimed that if Blacks accepted being Black, they were thought to be psychologically healthy and obtain high self-esteem while Blacks who accepted the morals and traditions of White society are believed to suffer from self-hatred and subsequently, low self-esteem.

Societal constructions burden Black people through explicit forms of institutional racism. During the immersion stage, Black people release all the negative stereotypes connected with their race and begin to view Black from a different perspective. Cross (1991) noted that immersion is a stage characterized by the desire to both surround oneself with visible symbols of one's racial identity and an active avoidance of symbols of Whiteness. This is the period where Black people are leveling off which is facilitated by internal growth and the acknowledgement that role models or heroes' function from a more enhanced state of identity development (Cross, 1991).

The next stage of Nigrescence is internalization. Internalization encompasses a transition period where one begins to confront and remedy the challenges associated with a new identity (Cross, 1991). This is the period where one begins to depart from how others view them to how they view themselves. Internalization solidifies the point of dissonance resolution and reconstruction of a person's steady state personality and cognitive style (Cross, 1991). Black people adopt the mentality to begin thinking critically about their newly discovered racial identity and the ways it has shaped their

lives. Given this discovery, they embrace all that it means to be Black and exude the self-love that tends to seep into the universe. The main component during this stage of Nigrescence is understanding that Black Identity works to fulfill the self-protection, social anchorage, and connecting the must haves of the individual (Cross, 1991).

The final stage of Nigrescence is internalization-commitment. This stage focuses on the long-term interest of Black affairs over long periods of time (Cross, 1991). The commitment stage is combined with the internalization stage because other than repeating what has already been said about internalization, a varied look at internalization-commitment acknowledges the results of future research. According to Benjamin et al. (1998), Black Identity development models assist in helping Blacks shed a meaningless vision of self-worth and progress towards the embracement of a positive Black self-definition. Healthy racial identity development is accomplished when Blacks progress through a series of linear stages that commence when degrading thoughts and emotions towards themselves and other Blacks associated with beliefs about Whites, and concludes with internalized positive feelings about themselves, and other groups (Ritchey, 2014).

STEM Identity

According to the President's Council of Advisors on Science and Technology's (PCAST) 2010 report to then President Barack Obama, STEM interest is mainly rooted in one's experience, the situational aspect of educational development. Hidi and Renninger (2006) offered a more cognitive element to the definition of interest as they believed interest is activated by curating uncertainty or incongruity in the learner as a response to a previously known experience or information. Also, interest is either situational or

individual and is based on the various characteristics of the learner and develops through four phases: triggered situational interest, maintained situational interest, emerging individual interest, and well-developed interest (Hidi & Renninger, 2006).

Phase one triggers situational interest which is the psychological state resulting from short-term changes in cognitive and affective processing connected to specific content. Phase two is maintained situational interest is the psychological state that involves focused attention towards specific content that reoccurs and persists over time. Phase three is emerging individual interest which is the beginning of relatively enduring predisposition to seek reengagement with specific content over time. The final phase is well-developed individual interest, the psychological state and disposition to reengage specific content over time. Measuring the growth of interest development within an individual is difficult at its best (Hidi & Renninger, 2006).

A study by Ullerich (2015) focused on the identification of teacher STEM interest/identity stories and their prospective influence on student interest and identity formation; but within the discussion, diversity of both teachers and students were considered. According to Dhamoon (2011), everyone has intersecting identities that are continually being redefined and reprioritized given their varies experiences in life. Therefore, as previously stated, no one has only one identity, but people are a compilation of varied identities based on their lives and experiences (Barton, 2012).

This leads to the importance of teacher awareness of their students already curated identities because teachers can be viewed as institutional agents which are individuals within a system that maintain a position of power over their students, but specifically

those of minority students (Stanton-Salazar, 1997). Given this position of power, teachers should be aware of their student's demographic background when they are sculpting their personal interest and identity formation. Bandura (1977) explained the social nature of learning but also emphasized the necessity of a connection between the teacher's identity and the miscellaneous developing identities of their students. Sensitivity to most identities is vital to students within underserved spaces who are not in a space mentally to envision their ability to succeed in STEM and STEM related content areas without clear and direct input from their teachers (Honey et al., 2014).

Given this reason it was important that educators from diverse backgrounds with advanced STEM self-efficacy and who recognized the values of STEM integration were considered for inclusion in the study by Ullerich (2015). The study by Ullerich (2015) was important to analyze as it pertains to my study because of the elaboration on STEM identity and the components that create intersections between multiple identities. Moreover, it assisted in furthering my understanding of the concept of STEM identity. Diversity was not the only factor that Ullerich (2015) considered in her study, but her participants, regardless of their demographic background, faced the psychological barrier of expert blind spot in identifying their STEM story.

Expert Blind Spot

Expert blind spot occurs in education when expertise in a content area result in being unable to identify prerequisite concepts or skills required for novice learners to comprehend the content taught (Nathan & Petrosino, 2003). Teachers who experience expert blind spots do not readily omit the prerequisite skills, and often are unaware of

having left out vital information or steps to a procedure in their instruction (Nathan & Petrosino, 2003). Ambrose et al. (2010) added that expertise is acquired through four phases. These phases are: (1) unconscious incompetence, where the learner is initially established to the content; (2) conscious incompetence, that reflects the beginning understanding with the requirement for structured practice; (3) conscious competence, the beginning mastery of the subject matter; and lastly (4) unconscious competence, where experts unconsciously utilize shortcuts in explaining content while blind to the comprehension gap in novice students (Ambrose et al., 2010). Conclusively, the unconscious blind spot is the result of cognitive automaticity of knowledge retrieval which is developed with a mastery of a content area and offers reasoning as to why students do not comprehend a concept after the expert teacher has repeatedly explained the information (Honey et al., 2014; Ullerich, 2015).

Expert Blind Spot and STEM Integration

Expert blind spot applies to both expertise in a single content area but as well as the educator's expert knowledge of how to think across the content areas within STEM (Honey et al., 2014). This statement suggests that it is a necessity for teachers to utilize metacognitive strategies to be able to articulate their thought process used to integrate STEM content areas. Ultimately, teachers define using metacognition their own thought processes that help them see the overlap across STEM subjects, students will then learn to replicate the same skills. Therefore, the main component to effective STEM integration may not be connected to curriculum or standardized pedagogy but the competency of STEM teachers to effectively communicate their paths to STEM identity.

Expert Blind Spot and STEM Interest/Identity Stories

Teachers' capability to communicate their STEM interest/identity story could also experience this same expert blind spot. Teachers STEM interests and identity stories are personal and explain the teacher's pathway to their STEM identity formation. Because identity formation is a slow process that occurs over time, teachers are not always aware of their development, much less their significance (Renninger, 2009). A way to assist teachers to identify their identity formation is examining the construction and deconstruction of STEM identity (Barton, 2012).

There are two main reasons behind dissecting teachers' identity. One reason is to identify the rewards and experiences that led to the teacher to decide to pursue a career in STEM education. This is for the purpose of sharing this information with students. The second reason is determining through teachers' STEM interest and identity anecdotes if an ability to deliver curriculum across content areas withholds a global perspective or paradigm that teachers utilize to make such connections (Ullerich, 2015). Overall, the goal is to have teachers overcome expert blind spots and become consciously aware of their STEM identity stories. In so doing, they can then apply their stories to negate the effects of expert blind spots during content delivery to break down their thought process for the purpose of modeling for students.

From its inception to its current state in the world, STEM education notably played a critical role in enabling the United States to lead the charge in technology in the global marketplace. The federal government strategizes through various incentives and fund regulations to influence the supply and demand curve by increasing the number of

students with advanced degrees for STEM careers. Subsequently, students are prepared for the STEM workplace, thus, allowing the U.S. economy to compete globally (Beatty, 2011). To bring this goal into fruition, teachers must define and detail their STEM identity through narrative discourse with students through social cognitive modeling (Ullerich, 2015). Developing a STEM interest and identity, including recognizing the incentives that incited the initial interest, creates an overlapping relationship between STEM content areas that can be referenced by the reflecting teacher to describe their cognitive method of STEM integration to students.

This section provided an overview of identity theory, its origins, and major components. This overview was intended to provide a base of knowledge about the constructs and terms of identity theory that will be used in forthcoming chapters. The next section of the literature review covers Critical Race Theory (CRT). This is another driving anchor for this study and providing an extensive background of knowledge on CRT is vital in understanding the importance of the study as it pertains to the original research question and the participants involved.

Critical Race Theory

My decision to centralize the significance of race by focusing my study on African American middle school STEM teachers stemmed from my own personal and professional experiences with witnessing racial dilemmas as a former educator and having built substantial relationships with my coworkers who were in the middle STEM space. During my time working in the middle school setting, I noticed that the standards placed on those STEM content areas was much higher than other subjects and all the

teachers for those areas were African American/Black. As a doctoral student, I learned about the salience of race in people of color's lived experience (Lopez, 2003), specifically how certain experiences influence the perceptions of themselves and their ability to succeed professionally. My lived experiences as a Black student and educator have caused me to encompass a Critical Race Theory (Ladson-Billings, 1998) approach to exploring this issue I have identified within education.

This section of the literature review includes a discussion of the literature that has been published about Black and African American teachers since 1970. That is when the states begin to implement the 1954 *Brown v. Board of Education of Topeka, Kansas*, desegregation order (Iron, 2002). I utilized educational databases to located articles and studies centered on Black and African American teachers, as well as Black and African American STEM teachers.

Critical Race Theory (CRT) provides a theoretical framework through which to analyze the experiences of the participants in the study. The principles and assumptions of CRT informed both the research design and data analysis. CRT scholars believe that racial analysis is required to further one's understanding of the societal blocks and inequities for people of color to suggest how those blocks and barriers can be overcome. Given the recent use of CRT in educational research, it is valuable to review the origins of the theory and the other contexts within which it has been applied. Emerging from the Civil Rights Movement, this measure in education research has been developed mainly in response to not only the racial inequities within education but to the increasing diversity within American school systems (Gay, 2000).

CRT grew from the work of legal studies over concern with gradual progress on civil rights and social justice issues. There were advances made in the 1950s and 1960s but progress on racial equality stalled and caused resistance as they grew into racial reforms like affirmative action. Legal scholars criticized the role that law played in the construction and continuation of racially and gender-based oppression (De Rosa, 2015). It is important to note that these scholars worked to redefine racism as a larger and systemic practice that upholds and sustains oppressive group relationships (Taylor, 2009).

From a CRT standpoint, the idea of race can be understood as a social construct as opposed to a biological one (Crenshaw et al., 1995). Lopez (2000) described race as a vast group of people who are loosely bound together by historically contingent, socially significant elements of their morphology or ancestry. He also claimed that it is neither an essence or illusion; more so an ongoing, contradictory, self-reinforcing, plastic process subject to the macro forces of social and political struggle and the micro effects of daily decisions.

On the other hand, Smedley (1999) noted that race emerges as the dominant form of identity in those societies where it functions to stratify the social system. Simply put, the emergence of racial identity was directly correlated to racism. Critical race theorists argue heavily that while race is a social construct, it is still real in the sense that there is a material dimension and value to the experience of being “raced” in American society. This is a materiality that has been curated and sustained by law (Crenshaw et al., 1995).

Ladson-Billings and Tate (1995) brought the ideas of CRT to the education field and identified the parallels between law and public policies that operate solely to exclude

people of color and educational practices that have the same purpose. Their description of how this occurs within the educational system stated that in schooling the absolute right to exclude was demonstrated initially by denying Black access to schooling altogether. It was later demonstrated by occurrences of White flight and a growing insistence on public funding for private schools. Within school systems, the absolute right to exclude is demonstrated by re-segregation via tracking, the institution of gifted programs, and other advanced courses. Billings and Tate (1995) argued that the use of CRT in education could provide a cohesive theory and tools to examine issues of educational inequality.

It is important to understand that CRT is rooted in several ideas, insights, and assumptions. Given the scholar, those themes and variations may change but the scholarship has a common set of themes identified by Taylor (2009): society's acceptance of racism, the phenomenon of Whites allowing Black progress when it promotes their interest, the significance of understanding the historic effects of European colonialism, and the preference of the experiences of oppressed peoples over opinion of Whites. The idea that racism is normalized and welcomed as part of the American culture is a key starting point when dissecting the theoretical framework.

Scholars often take the main approach of making visible how institutionalized racism is intertwined with and executed through the lens of politics, legal and educational structures, and institutions (Ladson-Billings, 1998). This constitutes that racism is embedded in the fabric of the social order which makes it appear both normal and natural to people in this culture. As it pertains to education, institutionalized racism permeates educational practices and structures but goes more toward the largely unnoticed and

unchallenged (Taylor, 2009). Even though CRT begins from the premise that race and racism are a central and pivotal part of distinguishing how US society functions, the theory also acknowledges the complex layers of racialized subordination based on various features including immigration status, surname, phenotype, accent, and sexuality (Yosso, 2005).

If one would like to understand CRT in its entirety it is important that they fully understand the inequitable educations and educational opportunities between opposing races through the analysis and discussion of historic patterns and reasons for the inequality. Without this background knowledge, the issues of education inequalities are seen as new problems as opposed to the expected outcomes of deliberate procedures and practices (Taylor, 2009). Historically, the interests of people of color in gaining racial equality have been accommodated only when they have converged with interests of those Whites in power (Bell, 1980).

A prime example of this would be the *Brown v. Board of Education* case in 1954 which dealt with school segregation. Scholars argued that examining the case from a political standpoint, the case showed that the desegregation ruling was likely encouraged more by foreign policy as opposed to concerns about equality (Bell, 1980). Some historians pointed out that the Supreme Court decision occurred during the peak of the Cold War when technological advances with modern technology such as television and photography meant that discriminatory racial practices were not globally visible.

Given these advancements, according to Bell (1980) and Taylor (2009), China, India and other countries regularly carried stories about the unfortunate occurrences

associated with the Klu Klux Klan, in addition to the living conditions of sharecroppers and prisoners. Bell along with other scholars concluded that even though the ruling of *Brown v. Board Education* (1954) had a significant public relations benefit to the country, there was little to no internal work done to end segregation and seriously address the long-standing inequalities in education. Ultimately, a convergence of interest may have led to what could be deemed as the morally right decision to promote a sustainable commitment to equality. Guinier (2004) stated that to obtain genuine and lasting change, efforts must be grounded in acts that involve a broader coalition of proponents who have equal concern about social justice for people of color.

Lastly, Critical Race Theory is grounded in a sense of reality that reflects and favors the lens and events of people of color and challenges the privileged experiences of Whites as the standard. CRT scholars typically use storytelling and counter narratives as a method to expose and challenge majoritarian stories and make visible the authentic experiences of people of color. However, counter narratives are also powerful pedagogical and research tools that allow scholars to better comprehend the experiences of colored people. CRT as a framework facilitates the assessment of racism in its various iterations which includes the intersectional points of oppression and the dominant narratives and claims required to explain the relative educational success or failures of one group over another (Ladson-Billings, 1998). In this study, while the research may appear to be the lived experiences of African American middle school STEM teachers, using the lens of Critical Race Theory, these experiences must be seen in a larger context.

Working Definition of Critical Race Theory

The political conversation surrounding Critical Race Theory is undoubtedly a triggering yet significant issue in the world today. Critical Race Theory is an extensive study that has found its primary home in academia, and has routed itself to the American word list through its omnipresent coverage in academic curriculum, political policies, and media coverage (Lopez, 2017). Since the inception of the theory, the definitions of CRT have changed which has promoted confusion and various theoretical debates regarding the true definition and use as a theoretical framework in education.

The original scholars who developed the framework, such as Bell (1980), Crenshaw (2010), and Delgado and Stefancic (1993), chose to respond to the Liberal Race Theorists, who viewed race issues as interpersonal and resolvable components of world affairs. At its foundation, CRT is a movement intended to place the issues of race on a serious level and address some of the world's most unfortunate problems within humanity. However, scholars built upon the work of previous generations which led them to curate miscellaneous versions of the theory within different institutions (Bergschneider, 2023). Ladson-Billings (1998) has made her mark within the world of academia and has also been a key voice for the intersection between CRT and education. According to Ladson-Billings and Tate (2016) she and her colleague used CRT tenets of systemic racism and interest convergence to define CRT in education and deconstruct racialized anecdotes and power structures utilizing social studies classrooms.

Politicians and media figures have crafted and vocalized the distorted versions of CRT to express their viewpoints of American race and education. In recent cases, laws

have been implemented to create a narrative of race that lawmakers see appropriate for the classroom, one that may or may not be truly telling. For example, Texas House Bill 3979 (Texas HB 3979, 2021) serves as the public definition of Critical Race Theory in the state of Texas. This bill encourages “essential knowledge and skills that develop each student’s civic engagement” and it forbids classroom discussion of any “particular event or widely debated and currently controversial issue of public policy or social affairs” (Texas HB 3979, 2021, p.1).

This law clearly cites and disallows teachings that have assisted in framing American history through the lens of race. This law also denies the impacts of systemic racism and any curriculum which includes points of racism and slavery beyond deviations from betrayals of, or failures to live up to the authentic founding principles of the United States (Texas HB 3979, 2021). In summary, Texas Bill 3979 both defines and disbands Critical Race Theory as the schooling of the content that establishes slavery as the authentic inception of the United States while simultaneously deeming slavery and racism as abnormalities from American values.

Therefore, the academic definition of CRT is the exposure of racism within the power structures of America through more inclusive and truthful historical narratives (Ladson-Billings & Tate, 2016). The public definition of CRT is the guild inducing burden of American racism created by racist founders and continued by intolerant leaders of racist institutions (Texas HB 3979, 2021). The American division between these opposing definitions of Critical Race Theory and the American history curriculum is

characterized by the development of *The New York Times*' 1619 Project (2019) and its counterpart The President's Advisory 1776 Commission (2021).

The 1619 Project focused on America's history with race and the aftereffects of slavery. This project included written and podcast form of notions that America's independence from Great Britain was a derivative of colonizer's desires to protect the institution of slavery from British legal reckoning (The 1619 Project, 2019). This project faced severe scrutiny for its bold stance, which included an open letter from highly notable American historians from several Ivy League institutions posing questions about the project's ideological framing versus its historical framing (Bergschneider, 2023). This intellectual feud represents the various versions of historical study.

National Presence of Critical Race Theory

The 1619 Project played a vital role in catapulting CRT's presence in American history education into a national spotlight in recent years. In response to this, the Trump administration issued the President's Advisory 1776 Commission to further a patriotic view of American history. Subsequently a political battle for the racial compass of the United States continued after Biden's presidential victory, demonstrating that while the Trump presidency ended there are still powerful divisions based on race in American classrooms. Several states have passed CRT suppression bills and 30 Congressional Republicans have sponsored a bill titled Stop CRT Act (The Washington Post, 2021). People across the country are becoming more cognizant of the speech surrounding the pedagogy and curriculum of American education, especially in the social studies and history classes.

Roots of the Critical Race Theory Debate in America

There is an evident correlation amongst race and power in American history, the systems, and her institutions (Chomsky, 2018; Frieire, 1972). The story of CRT in its modern state of debate is embedded in politics, media, and an American think tank (Bergschneider, 2023). CRT entered the public discourse in American when President Clinton's appointee, Lani Guinier was denied a position by Congress due to her touting Critical Race Theory as a law professor at the University of Pennsylvania. Appointee Guinier was not enough to place Critical Race Theory as a stable fixture in the national dialogue on race. Over the course of seven years, CRT was mentioned four times on FOX News. Following the unfortunate death of George Floyd, between June 2020 and May 2021, CRT was a leading topic on over 100 FOX broadcasts (Harris, 2021). It is important to note that George Floyd was not the only trigger for the country's racial issues over the last 20 years as several instances of racial injustice have swept the front pages everywhere.

The summer during the height of the COVID pandemic not only witnessed large scale protests rooted in racial tensions and frustrations but it also witnessed an increase in coverage of CRT. The spike in coverage is traceable to a public policy article written by Christopher Ruffo for a local New York magazine produced by the think tank, Manhattan Institute. The article gained significant traction which landed Ruffo a spot on a FOX News show where he began to warn viewers that CRT was being weaponized and urged President Trump to ban the framework in federal government training (Bergschneider, 2023). Shortly after Ruffo's appearance on FOX, President Trump boldly signed an

executive order which banned the use of CRT by all departments and contractors of federal diversity training (Harris, 2021). Between the executive order by President Trump, the blatant defamation and misinterpretation of CRT on nationally syndicated news networks, and the cancellation of bills that eagerly sprouted around the country, it was clear that the media was working to create a version of CRT that would be perceived as a threat to the public.

Critical Race Theory in Education

Ladson-Billings and Tate (1995), recognized the salience of race in American society and the failures of the reform movement of multicultural education to address the growing tensions between various groups who congregate under the multicultural umbrella. When CRT was brought to the forefront of education, the call was initially for substantive change in education and not the superficial and blind paradigms that would satisfy the social and political agendas of superior or dominant groups. Tatum's (2007) call was regarding attempts to uncover or decipher the social structural and cultural significance the role race plays in education to eradicate the long-lasting educational inequities that are rooted in racism. The basis of Tatum's (2007) call lay in the argument that racism was deeply instilled in American life, that Whiteness, when viewed as property, has valuable rights that Blackness do not, and offers details on how class and gender-based explanations are not strong enough to explain the differences in experiences for Black students.

Critical Race Theory in education would require: a belief that racism is endemic to society, a reinterpretation of ineffective civil rights law, and the presence of voices of

color (Carol, 2013). These three tenants support curating a framework befitting for studying Black teacher's perspectives on their impact. Such participants may offer a framework that foregrounds the voices and experiences of Black teachers by assuming that the prevalent nature of race and racism impacts teachers' perspectives and brings attention to laws that have impacted their experiences.

Critical Race Theory and Educational Research

In 1903, DuBois became one of the pioneers of bringing light to education and the professional plights of African Americans (DuBois, 2007). Over a century later, the experiences of African Americans are still misunderstood, omitted, and misjudged at the hands of other dominant groups (Mutegi, 2013). In the STEM and STEM education field, experiences of African American PhD professionals remain overshadowed by mainstream tales that disregard how factors such as race and racism influence their presence in STEM (Rosa & Mensah, 2015). Researchers have labeled the alarming underrepresentation of African Americans in STEM disciplines and professions as problematic (Fetcher, 1989).

Too often, educational research has failed to acknowledge the need of African Americans and other oppressed and marginalized groups in academia (Ladson-Billings, 1995). Educational research has not addressed the concerns of African Americans while simultaneously deemphasizing the influence of race on their academic achievements and used inappropriate or unfitting theories and methodologies to explain the conditions of African Americans in education (Parker & Lynn, 2002). Studies including Berry (2008), Jett (2009), Terry (2011), and Reynolds (2010) utilized CRT in educational research to

further understand the ways race obstructs and limits success among African American males.

Theoretically, CRT poses the question, “What analysis needs attention” regarding race related problems in education (Lynn et al, 2002)? Educational research that has used CRT as a theory has discovered race and racism to be components that regulated access to disciplines like mathematics. Jett (2009) took CRT and used it to reveal race as a factor that has placed barriers on access to the mathematics community for African Americans during their undergraduate career.

Educational research that utilizes CRT methodologies including storytelling and counter-storytelling, provide personal accounts of African American experiences to illuminate factors such as practices, supports, and identities that impact and promote their success (Watkins, 2016). Berry (2008) on the other hand, used counter-storytelling to discover themes that could be used to describe African American males’ success in mathematics in a middle school setting. Using CRT methodologies in educational research allows the influence of race in academic achievement to be addressed.

In science education literature, there are not many scholars who have employed CRT (Lewis, 2003; Mensah, 2014). Studies conducted by scholars emphasize the potential for additional utilization of CRT to understand racial inequalities within both science teaching and learning for African Americans (Brown et al, 2011). Often CRT has been used to analyze the practices of middle school science teachers and research finding have discovered that teachers who were cognizant of how race and racism negatively influenced science learning for their African American students were able to better apply

pedagogical approaches to assist their students succeed academically (Wallace & Brand, 2012).

Critical Race Theory explains how success in the science field across the various stages of African American students' educational phases can be compromised because of race and racism (Watkins, 2016). In Watkins (2016) study, CRT was used theoretically to spotlight race and racism from the scientist and engineers' perceptions of their STEM experiences, and methodologically to chronicle the personal anecdotes of persistence. Their narratives in this study succeeded in countering mainstream notions of failure to focus on the perceptions of African American PhD males and the agents that led to their pursuance of STEM.

In a qualitative study by Watkins (2016), he sought to investigate the factors that impacted the persistence of African American male PhD scientist and engineers in STEM career trajectories. The experiences of African American male scientists and engineers were examined from the men's perspective through a CRT lens. CRT was used in this study as the theoretical perspective to document the factors that impacted African American male PhDs in STEM as valid evidence of their experiences in STEM and to bring attention to the role that race played in their persistence. The study also had implications for K-12 STEM communities, university STEM educators, as well as policy makers with an interest in African American male interaction.

Critical Race Theory informed Watkins' (2016) analysis and interpretation of the study's data. Utilizing a CRT framework placed issues pertaining to race and racism on the front line of the analysis process and allowed him as the researcher to construct

themes from the data that assisted in foregrounding their experiences. Watkins (2016) discovered that the experiences which led to persistence for African American male PhD scientists and engineers in their respective STEM communities could be exposed when researchers focused on the lives of African American scientists and their persistence in the field. Recognition in STEM has notably been a factor that impacts African Americans pursuit of the field (Berry, 2008; Pearson, 1985). Parental support, peers, role models, mentors, and university types have all been identified as crucial factors that encourage African Americans to succeed in the STEM and STEM related fields (Hamilton, 2004; Walker, 2006; Hanson, 2007; Patton, 2009).

Critical Race Theory in Empirical Studies

As it pertains to education, it is important to study how practitioners are curating and examining curriculum from a CRT perspective. Given that it is highly politically charged, the teaching of race comes with a set of special challenges (Milner & Howard, 2004). Hambacher and Ginn (2000) used CRT framework to analyze how the politically motivated concepts of race were navigated by teachers over the course of 16 years. The researchers collected 39 articles focused on race visible education during that period to examine how education systems support racist ideologies through school curriculum which CRT argues is a culturally specific relic designated to maintain a White supremacist master script (Ladson-Billings, 1998). Sleeter's (2001) *Journal of Teacher Education* literature review unlocked a gap in pedagogy preparation for culturally diverse schools. Across the empirical studies, researcher's key focus was on pre-service teachers working in diverse environments, while the remaining teachers were examined

(Hambacher & Ginn, 2020). Findings from this study indicated that racially visible professional development suffered a decline in meritocracy and was troubled by the political traces of race.

Critical Race Theory and Studying Black Teachers

Critical Race Theory offers Black researchers and Black teachers an opportunity for academic language and theoretical grounding for discussing issues of oppression surrounding systems, the man, and White folks. Utilizing CRT as a framework for this research brings those forbidden conversations to light in a constructive manner where race-talk is appreciated and allowed. Researchers have proven that when given the space to address thoughts and issues about race, Black teachers have much to contribute (Carol, 2013).

Morris (2001) discovered that Black educators' reflections on mid 1980s school desegregation ruling in St. Louis reflected CRT viewpoints and that was without him applying the framework when he initially collected data. During his analysis, Morris (2001) realized his selection of qualitative methods and his decision to analyze Black teachers were in line with CRT's emphasis on valuing the voices of Black teachers and how eager they were to discuss the perils of race and ways racism affected the implementation of the St. Louis desegregation plan.

Based on Morris's account of the racially hostile occurrences, research findings concluded that several Black teacher's jobs were at stake, or they were terminated when schools desegregated (Morris, 2001). Thus, it is quite fair to think that prior to Morris's investigation, few researchers had probably allotted Black teachers the opportunity to

discuss their thoughts on how racism was impacting the debates surrounding desegregation. Morris claimed that most Black teachers experienced the “push-pull” syndrome. Morris (2001) expressed that “on one hand, they were compelled to support efforts aimed at eradicating legalized segregation in public schools and the broader society,” but on the other hand, “many realized that Black children would encounter modified and covert acts of racism in schools that were integrated in student populations only, but not in teacher personnel, curricula, and power arrangement” (p. 579). Morris adopted a race-centered focus to explain how the desegregation agenda specifically impacted African American students and caused educators to take part in the interviews and were excited to share personal anecdotes like Dingus (2006) who also investigated the desegregation tales of Black teachers.

Personal Voices

The component of CRT that heavily encourages race reflections amongst teachers is its emphasis on the experiences of Black teachers. During my research collection process, it was intriguing to understand how all the participants viewed race and how they viewed race in correlation to their professional identity. This aspect of the theory is based on the belief that reality is socially constructed (Banks, 1995). CRT voices are discovered in the form of personal stories, often noted as counter-stories or narratives (Solorzano & Yosso, 2002). When researchers use voices of Black people as a central part of their research, the chance for substantive discussions where race is the focal point significantly increases (Carol, 2013). Lynn (1999, 2002) proved this point in his work.

Lynn (1999) used CRT as a framework to study the beliefs, attitudes, and practices of Black teachers who had been seen embracing CRT principles in their teaching styles. In his study, Lynn (1999) chose teachers as participants who expressed a commitment to problems of social justice and had a definitive sense of both their racial and political identity. It is important to note that Lynn's (1999) study could be deemed problematic because it assumes that Black teachers already have knowledge of critical race pedagogy and that is not always the case. Opposed to studying how teachers determine whether CRT could aid them in their efforts, Lynn focused on how teachers found out their practices could help exemplify a CRT approach. The teachers for his study were based on their political and political related interests yet he still assumed that these teachers were free from psychological restraints of racism that CRT says permeates society as a crippling assumption.

The Impact of *Brown v. Board of Education* on Black Teachers. In the world of education scholars cannot think about the state of Black teachers without reflecting upon the impact and consequences *Brown v. Board* (1954) had on Black educators, and the Black community (Fairclough, 2004). Thus, I feel it is important to discuss the *Brown v. Topeka Board of Education* (1954) desegregation court case before diving into the experiences of Black teachers post the landmark case. This will assist in making the connection between racial equality and educational equity.

In 1954, the National Association for the Advancement of Colored people (NAACP) hired lawyers to successfully argue the landmark case *Brown v. Board of Education of Topeka, Kansas* which declared segregated schools unconstitutional and

ordered all schools to integrate both their staffs and student bodies. Many educators have since continuously questioned whether this court decision accomplished the intended goal of educational equality and equity regardless of race, while some also suggested that desegregation added injury to insult pertaining to Black students and Black teachers (Foster, 1993; Fultz, 2004). The Supreme Court decision came into question because there was an exponential decline in the number of Black teachers in addition to a decline in the status of Black teachers from the lens of Black students and Black parents (Milner & Howard, 2004). Research also indicates that Black teachers' hostile experiences in integrated settings impacted their professional development and personal self-esteem (Fairclough, 2007).

Decline in the Number of Black Teachers

Apart from a few scholars such as Du Bois (1935), there was not a lot of research conducted on how desegregation negatively impacted the Black community. Black activists were reluctant to analyze the implementation and impact of *Brown v. Board* because of the hard work and outstanding efforts of the Black community to achieve school desegregation (V.M. MacDonald, personal communication, February 1, 2008). Hudson and Holmes (1994) argued that the way racist policy makers executed the *Brown v. Board* desegregation case caused education to become a lost career field for African Americans. The implementation of the new order implied that White school systems were better than the Black systems and Black systems lacked value and credibility and subsequently could be expunged in the quest to integrate schools (Hudson & Holmes, 1994). After the order was executed, Black schools began to close, and layoffs and

dismissals of thousands of teachers ensued. Not to mention, thousands of teachers were denied jobs in White schools (Foster, 1993). Within a decade following the landmark court case, it was reported that 38,000 teachers had lost their jobs in the southern and border states causing a significant decrease in the number of Black teachers (Ethridge, 1979)

The *Brown v. Board of Education* case not only impacted the number of Black teachers but the number of Black college students majoring in education also seriously declined (Carol, 2013). Between 1975 and 1985, the number of Black students majoring in education declined by a heartbreaking 66%. This consequently devastated the number of Black teachers produced during that period. In addition to decreasing numbers of Black education majors, there are other reasons noted that contribute to why Black teachers have continuously declined over the years including but not limited to: Black teachers not being able to pass certification tests, the availability of more lucrative jobs or obtaining jobs that they deem to be more impressive than teaching (Berry, 2005).

While the number of Black teachers were declining, the way the *Brown* case was executed negatively impacted the status of Black teachers and their relationships with education stakeholders (Fairclough, 2004; Foster, 1993). Before desegregation, Black teachers were highly respected and placed on very high pedestals within the Black community (Foster, 1993). Following desegregation, Black teachers were voided of their designation as competent authority figures from the perspective of Black students, as well as Black principals who were demoted to lower lever administrative and leadership roles where their primary responsibility was to discipline Black students (Walker, 2009).

Before *Brown v. Board*, Black teachers were more than just teachers. They were revered members of the community (Foster, 1993).

The key elements of CRT in education, that is, race as endemic to society, significance of including voices of color, and representation and empowerment, provided the theoretical context that pushed my methodological decisions and served as backdrop for my study on Black and African American middle school STEM teachers. My focus on Black and African American teachers' perceptions and reflections pertaining the intersection of their professional identities stems from the CRT principle that emphasizes the importance of including the inputs of people of color in discussions of educational issues. Critical Race Theory notably challenges dominant ideologies and is reflected in my decision to focus on how the intersectionality of race and professional identity contributes to what makes teachers successful. The underlying assumption through my research design is that race and race related issues are endemic to the United States' education system, and therefore, endemic to discussions of educational success from the perspectives of marginalized teachers in an urban school district. This assumption is clear in my choice to limit the participants to Black and African American teachers and to limit the focus to their perspectives on success from various perspectives.

Ecological Systems Theory (EST)

The Ecological Systems Theory (EST) represents a merging of biological, psychological, and social sciences. Through this theory, researchers and scientists seek to explain ways an individual interacts with the interrelated systems within their individual environment (Bronfenbrenner, 1983). Ecological Systems Theory describes human

development through the lens of environmental interconnections and their impact on growth. Bronfenbrenner (1983) believed that human development is the result of interaction between the growing human and its environment. Bronfenbrenner intended to develop a view of human development that could explain growth in lieu of examining deficits within a person which has been an issue in other developmental models. Social science studies prior to Bronfenbrenner only focused on child development in relation to their parents but the studies explored none of the reciprocal influences that both parties would have on each other.

Bronfenbrenner's theory was influenced by sociocultural theory (Vygotsky, 1978), social learning theory (Bandura, 1971), field research (Lewin, 1939) and publications centered on the public policy on child development within the education system (Vandenbroeck et al., 2017). Bronfenbrenner sought a theoretical model that would offer a basis for empirical research that would expand upon the already existing theories on child development in favor of a holistic and comprehensive approach to merging systems theory. A systems approach views the individual as part of a group where each sector of the system has an important role where all behavior makes sense within the context of the system (Gerhart, 2014). Also, Bronfenbrenner did not view nature nor nurture as an influence, but he viewed both environmental and biological properties of a person as a requirement to describe ongoing development (Bronfenbrenner, 1979).

Bronfenbrenner was an American psychologist born in Moscow, Russia in 1917. Considered to be one of the world's experts on child development psychology with

Ecological Systems Theory, Bronfenbrenner led the charge in helping society understand how life and the development of life was not one-dimensional. Ecological Systems Theory was paired with grounded theory research, and it is still utilized in education and psychology today (Hayes et al., 2017). Grounded theory is especially utilized in phenomenological studies because it grants a foundation for understanding how data collected from lived experiences can be comprehended theoretically (Corbin et al., 2007).

Initially, EST was set to focus on the ecological approach of the ecological framework as published in *The Ecology of Human Development* (Rosa et al., 2013). The ecological framework is defined as the process of understanding the connection between ecological systems that coexist and interact upon both the negative and positive development of an individual (Bronfenbrenner, 1979). Children, in addition to adults, are embedded in ecological connections through their social interactions, attending community-based institutions, and within the family itself. The two most influential systems in childhood through adolescence are family and school (Ibrahim et al., 2020). Bronfenbrenner proposed that various systems influence individual's lives in various ways (Crawford, 2020). The systems within a person's life occur at different levels. Bronfenbrenner lists the following systems: micro, meso, exo, macro, and chrono.

Microsystem

The person's direct environment is composed of a system influence called the microsystem. This is defined as a pattern of activities, roles, and interpersonal relations that are endured over time by the developing person in a space with distinct physical and material characteristics. Interaction at this level can be social or symbolic and should be

experienced in a progressively complex manner (Bronfenbrenner, 1983b). The microsystem includes a person's personality, beliefs, and their temperament. Individuals with families or others who occupy their home or immediate space are also part of one's microsystem.

According to Bronfenbrenner this level of the ecosystem should not be understated. Evans and Bronfenbrenner (2000) wrote that microsystems provide the outlines for the processes that influence the psychological development of the individual. It is important to note that experiences are also critical to understanding how influences of the microsystem function. Direct experience through contact within the microsystem has a more impactful influence than indirect contact through other systems (Bronfenbrenner, 1979).

Mesosystem

The mesosystem describes the second level of the ecology of human development. The mesosystem is a system of microsystems (Bronfenbrenner, 1979). This system is the linkage between the various microsystems in an individual's life. For example, how school and home interact creates a mesosystem. Bronfenbrenner conceptualized that varying systems may work with or against each other in a person's life. These interactions are responsible for creating layers within the mesosystem.

School provides an example of this system. The classroom, students in the classroom, and co-teachers or teachers' assistants create a microsystem for the teacher. The school itself, the student body, the faculty and staff at the school encompass a

mesosystem for an individual teacher. Systems that influence one of these environments but do not include the individual, compose a third layer of the ecological realm.

Exosystem

The exosystem is like the mesosystem seeing that is made up of microsystems that intermingle with one another; however, in the exosystem at least one of the microsystems cannot contain the person at the center of this system (Bronfenbrenner & Evans, 2000). An example of this would be the workplace of a parent. Even though their child is not associated with their workplace system, he or she can be influenced by that system if the parent is required to work extra hours, miss school events, or create an uncomfortable or unwelcoming home environment. Given that the child is not part of the workplace environment, this is not part of their micro or mesosystem. This influence occurs at the exosystem level.

Macrosystem

The macrosystem is defined as the overall culture and societal structure (Brim, 1975). The macrosystem produces a pattern of interaction between and among the differing micro, meso and exosystems (Bronfenbrenner, 1979). This system is interpreted as the blueprint for a particular culture or subculture (Bronfenbrenner, 1994). Within the macrosystem, Bronfenbrenner described the ways that the culture of a family develops within the structure of the family in the microsystem. While all these systems are impacted by the overall society, there is a distinctive emphasis on cultures within the groups, and opportunity structures that are created by systems and experienced by individuals (Bronfenbrenner, 1983b).

Chronosystem

The chronosystem consists of the pattern of environmental events and changes over the life course in addition to the changing socio-historical circumstances.

Bronfenbrenner (1986) later added this concept because most human development theorists only viewed time in relation to aging. Bronfenbrenner (1986) introduced ecological transitions as the movement within a microsystem that changes the makeup of that microsystem. The magnitude of these transitions are said to be influential and have developmental impact throughout the lifespan.

Ecological Systems Theory was curated by Bronfenbrenner (1979) as a theoretical concept. His research was based on the theoretical underpinnings that began prior to the theory's establishment. Bronfenbrenner was groundbreaking in that he wanted to develop a theory of human development that would encompass all of the systems that were vital to the functioning of the lived experiences of an individual regardless of the proximity of the influence. While these concepts are notable in various fields, for this research, Ecological Systems Theory was used to help determine how the different systems within the teachers' lives impacted their experiences and correlated to their success as Black STEM educators.

Process-Person-Context-Time Model

The second phase following the duration of EST's development, focused on individual's development processes within the ecosystem (Rosa et al., 2013).

Bronfenbrenner's last phase of his theory began in the early 90s and continued until his passing in 2005, where he then fine-tuned the focus on the creation of a four-element

model that placed the individual in a Process-Person-Context-Time model as an expansion of EST and renamed it Bioecological Systems Theory (often used interchangeably in research and literature) (Bronfenbrenner, 1986 as cited in Tudge et al., 2016).

The PPCT model recognized the presuppositions of the ecological theory as requiring the identity of the process in context within an individual's biological characteristics and relation to time to generate accelerants that drive the development of the individual (Honickman, 2023; Mercon-Vargas, 2020). By developing the PPCT model, Bronfenbrenner was more efficiently able to theorize human development as it pertained to the interaction between the personal characteristics of an individual and the interactions that individual had within the context of interdependent systems in a matter which could be scientifically examined (Bronfenbrenner, 1986 as cited in Stokols, 1996).

Erickson et al. (2018) maintains that learning occurred through biological readiness and related systems that simultaneously connected current opportunities at the appropriate times. Bronfenbrenner's model integrated the biological and environmental influences through a systemic approach. This approach to theorizing the framework has been a widespread method for facilitating research in various fields including but not limited to child development, social psychology, education, psychology, mental health, and policy making (Eriksson et al., 2018).

Presuppositions

To understand the process of child development one must use the concept of proximal processes. Effective learning requires three things when interacting to gain a

new skill: repetition with the skill, frequency of interactions that require the use of the skill, and the interaction must occur over time (Mercon-Vargas et al., 2020). It is vital to note that developmental change requires time and is not instantaneous (Bronfenbrenner, 1979). Honickman (2023) applied this this presupposition to a child learning to play baseball as it is disaggregated by the above three requirements. A child gains the skills of becoming a proficient baseball player through the process of playing different positions during practice and by playing in daily practices.

Personal characteristics and context involve two moderators for understanding the process of promoting development (Bronfenbrenner, 1979). The moderators are variables that can change the effect of the other variable that influences the developmental process. Personal characteristics of the individual include biological factors of the child that influence their ability to perform expected skills (Bronfenbrenner, 1998). Going back to the baseball example, the child's personal characteristics can include lean body mass, competitiveness, strength, social competence, past playing experiences, and their enjoyment of viewing television sports (Yendork, 2020). These are the characteristics that originate from the individual and drive the skill progression in the appropriate direction. Bronfenbrenner (1994) emphasized that during proximal processes there must be two levels of personal characteristics. He explained that the characteristics must be qualitatively described for development to be effectively analyzed.

The final aspect of the PPCT model is the context. The context includes all the environmental factors and components that contribute to developmental learning (Mercon-Vargas et al., 2020). Drawing back to the baseball example, the context includes

the learning skill that can be viewed as existing within the context of the Little League team. The Little League team is the key moderating variable since it can influence strengths and weaknesses of the learning outcomes for developing the skills for playing the sport (Tudge et al., 2016). Within the game of Little League, context influences skill building by the organized team approach differs in frequency and repetition for the child compared to participating in an occasional informal game with loved ones. Ultimately, the elements of process, person, context, and time can be studied while describing the ecological systemic approach to skill development (Honickman, 2023).

Strengths of EST

Ecological Systems Theory is favored theory for research pertaining child development given its ability of the theory to capture the complexity of development through a lifespan while paying attention to the person-context perspective of comprehension as it relates to various systems (Eriksson et al., 2018). EST is notably comprehensive by taking a holistic approach in understanding the multi-faceted influences of environment, biology, and systems theory over aged developmental theories when focused on learning. EST annotates various aspects of development which include positive and negative occurrences in addition to the resiliency over negative events.

To help show the flexibility and utility of EST in educational climates, two peer-reviewed articles are explained. Burns et al., (2015) upheld that EST is an effective model when addressing miscellaneous school issues that include but are not limited to bullying, school violence, parental involvement, classroom management tactics, and prevention and retention programs. Burns (2015) stated that prevention programs need to

have an ecological approach that includes student, parent, teacher and administrative policy implementation and enforcement. Leonard (2011) emphasized that developing smart education should focus on the role community plays in supporting students in areas that the school is not able to easily access. Leonard (2011) viewed Ecological Systems Theory as the most effective theory to comprehend the snowball effect of community collaborations at the exosystem level in relation to individual student success.

EST is a holistic approach to understanding development based on the integration of interconnected environmental systems to the individual's biological attributes. The biological agents of PPCT model brings strengths to the theory by considering the personal characteristics of a child and how those personal characteristics shape the approach to situations and experiences that makes one's development atypical from siblings and peers (Tudge et al., 2016). Biological and environmental characteristics include temperament, resiliency, intellect, gender and other appearance properties are all considered when viewing EST as a well-rounded theoretical framework in various research fields (Mercon-Vargas et al., 2020).

The effect that healthier systems can have over negative occurrences that happen within other systems in a child's life also contribute to a holistic approach in development (Hayes et al., 2017). Maltby (2019) defined resiliency as the individual's adaptive ability to rebound back to pre-stressor levels of functioning after adversity. Resiliency is a tenant of EST as well as an individual trait and systemic reaction to adversary (Boom et al., 2012). Seeing how EST is a critical framework in education and psychology, this framework is applied to various rehabilitation programs that focus on humanitarian issues

which can include the livelihood of child soldiers (Kiyala, 2021). Resiliency has helped establish EST as a useful model when applied to understanding trauma, familial and community responses, and impacts on the individual's system for recovery (Boon et al., 2012).

Criticism of EST

There are not many criticisms that exist surrounding EST, but the primary criticism of Bronfenbrenner is the hurdle of understanding when there is enough information to draw conclusions on a person's development (Watts et al., 2009). The systems within the theory as individual components are exposed to over a lifetime are forever changing with multiple people and policies to be included in data gathering. The amount of information that is needed can be critically assessed, therefore leading to disagreements on the importance of one system versus another one. Implementation of research can be problematic in knowing everything that needs to be recognized for the most accurate presentation of development (Watts et al., 2009). Researchers have also argued that EST lacks a detailed understanding of a pathway that leads to healthy development. Therefore, contrary to previous developmental theories that detail the steps and phases of development, EST fails to offer standards on what should be accomplished and when, but focuses on how it happens (Watts et al., 2009).

CHAPTER III

METHODOLOGY

This study explored the influence that race has on participants' professional identity as middle school STEM teachers in the P-12 context. This exploration illuminated how participants articulated their personal identities and how these identities intersected in the classroom/school context. As research is the process of developing an understanding of human experiences, this chapter explains the selection of a qualitative frame through detailing the research question, explaining the rationale for using a qualitative methodology, articulating the theoretical approaches, describing the data analysis process, and addressing the trustworthiness of the study along with key ethical considerations. Defining my study as a qualitative multisite case study is the beginning of organizing the remainder of the study.

Method

Qualitative research promotes a particular way of thinking about a problem and asking the necessary questions to get answers (Hatch, 2002). This research approach looks to find meaning from common themes within responses from collected data and is used to build knowledge based in a specific area. Qualitative methodology was selected for this study because of the ability to provide descriptions of firsthand experiences of the participants (Johnson & Onwuegbuzie, 2004). This research method is most appropriate for this study as this research sought to explore how identity influenced African American teacher performance in the classroom. Using this method allowed me to see how these experiences impacted their daily functioning in the classroom and school

community, coupled with how it contributed to the growing dimensions of intersectionality.

Qualitative method is the design for this study because the context of qualitative inquiry is not constructed or modified, as the aim of qualitative research is not to verify any predetermined ideas but be a discovery that leads to new insights (Sherman & Webb, 1988). As the researcher, I was the primary instrument of data collection which required extensive engagement with the study. By seeking to understand how participants think about experiences and what those experiences made them feel, qualitative research acknowledges a level of subjectivity (Hatch, 2002). Therefore, this research more appropriately aligned with qualitative research methods.

Qualitative research methods value openness and flexibility which grants researchers the opportunity to focus on the phenomena they are exploring in its entirety and in its natural setting (Leedy & Ormrod, 2001). Emphasizing the interpretive, experimental, and situational characteristics of qualitative design, narrative inquiry, which acts as the theoretical approach, allowed me as the researcher to analyze data from patterns and themes based on the anecdotal information shared with me.

Theoretical Approach

Multisite case study with multiple cases can make a vital contribution that seeks to understand processes that may explain the realities within certain professions and their connections to society (Kathard et al., 2020). Narrative analysis and case study acted as the theoretical approaches for this study. A narrative framework was considered for organizing and interpreting the case data, which consisted of the responses provided by

the teachers. The teachers responded to questions that were included in the interview protocol. This helped me as the researcher understand the participants as individuals and as narrators in relation to their occupational and racial identities.

Narrative analysis utilizes participants storytelling to describe their individual experiences. Narrative research intends to capture and contribute to the understanding of stored knowledge (Burner, 1986). Salient to this study were the descriptions of how participants experienced various professional situations, inside and outside of the classroom context, at the hands of their race, that impacted the various components of them providing instruction, and other duties as a teacher.

Narrative inquiry is grounded in Vygotsky's (1978) theory of learning (Clandinin, 2007). This theory believes that knowledge is socially constructed through shared understandings. Since narrative inquiry has roots also centered in postmodernism, with an emphasis on constructionism, researchers consider the identity of the participant. Experience in narrative inquiry usually encompasses more than what is happening periodically with someone, but it also focuses on the institutional narratives that shape these individual experiences. Narrative inquiry is about understanding experience from a personal and social perspective (Clandinin, 2007, 2013; Clandinin & Connelly, 2000).

I explored two middle school campuses and interviewed four teachers from both campuses. Case study in tandem with narrative inquiry served as my theoretical approach for this exploration. In tandem with the narrative analysis, case study is used to compare and potentially replicate the findings in order to draw cross-case conclusions from the

information collected (Yin, 2017). A case study is an empirical inquiry that analyzes a contemporary phenomenon within its real-life context (Yin, 2008). A case study will offer context to understand a phenomenon from the participants' perspective. A case study model includes four applications (Yin, 1994): it explains complex causal links in real-life interventions, describes the real-life context in which the intervention has occurred, describes the intervention itself, and explores situations in which the intervention being evaluated has no clear set of outcomes.

While there is no formula for a theoretical approach, the main decision for using this additional approach was my research question. My question seeks to explain a contemporary circumstance using "how" as the guiding force requiring an in-depth description of a social phenomenon; in this instance that phenomenon is race (Yin, 2017).

Case Study

Case study was also chosen for this study because it was the ideal method for the in-depth exploration that is desired to bring the details from the perspective of the respondents. Yin (1994) suggests that as the researcher, I closely follow the research questions and units of analysis which are part of the case study design intended to link the data and interpret the results.

Case studies are derived from the desire to gain an understanding of a single or small number of cases set in the context of the real-world (Bromley, 1986). Yin (1994) stated that a case study design must include research questions and its propositions, units of analysis, and a determination of how data is connected to the propositions and criteria

to examine the findings. Yin (1994) asserted that case study research is the preferred strategy when trying to unlock the answers to “how” and “why” questions. This type of research must also consist of pre-determined data collection systems, and pre-described analysis.

Re-statement of the Research Question

This study used qualitative research methods. Case study and narrative analysis were used as the theoretical approaches that guided this study. The participants provided in-depth responses that served as a gateway for new and emerging data. Questions were developed to gain more insight related to the four intersectional identities, that is race, teaching identity, STEM, intersectionality, that framed this study.

Does African American (racial) identity influence STEM teacher performance in the middle school classroom context?

Sampling Techniques

This study used purposeful sampling when choosing participants and institutions. Purposeful sampling is most appropriate when a researcher needs information-rich data from a specific population (Patton, 2002). Purposeful sampling is widely used in qualitative research for its identification and selection of data rich cases related to various phenomena of interest.

Participants

Participants were chosen based on the criteria established by the researcher. The criteria included African American race/ethnicity, STEM teacher, middle school teacher, that is, grades sixth through eight, and at least two full years of teaching experience. Flick

(2009) stated that selecting a participant sample in qualitative research is for the participants to offer substantive and relevant information.

Specifically, participants for this study were selected by their identification based on objective criteria that include African American/Black, sixth-eighth grade full-time middle school STEM teacher, teach at a public school, and have a minimum of two years classroom experience. Participants must have a minimum of two years classroom experience because teacher identity should be viewed as a teacher's sense of self which includes various dimensions (Watson, 2006). Teacher identity may not be fully developed in one year of teaching as that is often the first year. For most first-year teachers they usually focus more on professional development as opposed to actual curriculum delivery. Participants could teach in any of the four disciplines: science, technology, engineering, and math. Complete descriptions of participants are included in Chapter IV.

There were eight participants. For this research, a STEM teacher is defined as anyone who teaches full time in a STEM field. **I selected four male and four female teachers from each campus.** The responses in their semi-structured interviews led to the discussion of findings and recommendations for future research.

For this research the required criteria is further defined: *African American or Black* is a person who self-identifies as having origins of any Black racial group in Africa. *STEM* involves the various disciplines in science, technology, engineering, and mathematics. These disciplines also include mathematics, statistics, computer/information science, computer programming, electrical, chemical, mechanical,

civil, or other engineering; and physics (Anderson, Sun, & Alfonso, 2006). *Middle School Teacher* teaches at a school between an elementary school and a high school, typically for students in the sixth, seventh, and eighth grades. *Experienced Teacher* is defined as a teacher with more than three years of teaching experience (Hunaiti, 2021).

Site Selection

Below are two tables that offer the demographic and sociographic information for the campus selections. The campuses selected were based on predetermined criteria location, institution type, and teacher availability. Campus Purple and Campus Blue, pseudonyms, had similar demographics, STEM course availability, and were in the Southeast Texas Region. Diverse student bodies are usually reflective of diverse faculty. This study focused on African American STEM educators, especially the role that certain schools play in their identity which can impact their responses. Campus Purple is represented in Table 1. Campus Blue is represented in Table 2.

Table 1: *Campus Purple*

Campus Purple	
Number of Teachers	36
Student Population	593
Student Racial Demographics	African American – 54% Hispanic – 44% Two or more races – 1% White – 1%
Economically Disadvantaged Students	98%

Table 2: *Campus Blue*

Campus Blue	
Number of Teachers	52
Student Population	919
Student Racial Demographics	African American – 7% Asian – 1% Hispanic – 89% Two or more races – 1% White – 3%
Economically Disadvantaged Students	85%

Gatekeeping and Recruitment Strategy

Gaining entry to a public school for research purposes required working with principals and assistant principals. Patton (2002) identified these individuals as gatekeepers. Gatekeepers are informants who are knowledgeable about inquiry and are proven useful in helping an observer understand what is happening and why.

The recruitment strategy for this study included meeting with the principal of each campus who were the academic gatekeepers (Patton, 1990). As the researcher, I met with principals at each study site. I received IRB approval required me to develop and identify all recruitment documents. At the beginning of the interview process, participants completed a personal demographic sheet to verify that they meet the criteria.

Experienced teachers can identify problems related to the structure and organization of lessons. They accept accountability for problems and can identify solutions within their control as they are aware they are a key component for student learning (Kagan, 1992). Given the role they play in student learning, experienced teachers are also quicker to recognize and admit their knowledge inadequacies and are

more willing to learn. In subject areas which they lack the skill to teach effectively, experienced teachers identify the vital components of skills so they can dissect them and teach each component sufficiently (Lortie, 1975).

Dealing with Sensitive Topic

To understand the experiences of race and teaching at campuses in urban settings, I asked questions that focused on the intersectionality of race and professional identity. I am aware that during a time of highly publicized social injustices, and a nationwide teacher shortage, these anchors could be a sensitive topic. A sensitive research topic is a topic that has the potential to be intimidating to the researcher and/or the participant(s) (Lee & Renzetti, 1993). While interviewing and asking the participants the questions, I implemented three strategies by Rubin and Rubin (1995): paying close attention to the spaces and gaps in their conversation, watching to see whether the participant avoids answering the question, and lastly, asking about the issues the participant(s) had trouble discussing and/or responding to. Given the sensitivity surrounding race, I provided a safe and supportive environment in which they will feel comfortable discussing.

Researcher's Role Management

I established a personal relationship with my study participants; however, I maintained participant and researcher boundaries to ensure that I did not allow myself to become attached, or emotionally involved (Rubin & Rubin, 1995). Hence, speaking in terms of boundaries I also provided opportunities for member checking to ensure trustworthiness throughout the research process. I conducted semi structured interviews to uncover the participants' views. To ensure accuracy of the data transcribing, my role

included operation of audio recording equipment and maintaining a professional environment for the participants.

Ethical Consideration

Before initiating this study, I obtained proper clearance from the Prairie View A&M University Institutional Review Board. This was required to ensure all guidelines were adhered to with the ethical principles outlined, in accordance with research methods involving the safety of human subjects by the IRB. This is vital because as the researcher I worked with the participants in a frequent face-to-face mode. This is also important because researcher-participant relationships affect research outcomes. As a narrative researcher, I gathered a substantive amount of information that can include personal anecdotes.

Protecting the confidentiality of the participants was a vital component of the study. Issues of confidentiality are usually challenging in research studies (Merriam, 1998). I provided confidentiality through pseudonyms for the campuses and participants. Each participant received a color and number as their pseudonym. During this study the data was locked and filed away only accessible to the researcher and dissertation committee chair.

During qualitative research there are large amounts of data that are collected. To ensure that privacy is maintained during this process, I familiarized myself with policies related to record keeping pursuant to the Institutional Review Board at PVAMU. The data obtained was transformed into a retrievable form as soon as possible after collection to prevent loss or deterioration (Lin, 2009). The require length of time that data should be

stored varies by funding agencies, but it is more important to note as a researcher that a verbatim record is usually used to demonstrate the existence of information in the case of an audit as well as for data confirmation (Lin, 2009). Ultimately, data should be protected for future use in verifying findings, setting priorities, or reanalyzing (Steneck, 2004).

Reciprocity

Bresler (1960) recommended researchers increase the benefits and minimize the hurt during a study. Benefits of a study are not only for the researcher but the subjects participating also. A benefit of my study is the growth knowledge in the field of teacher education and experience. Sharing my findings with the participants provided them, along with school administration, a clearer understanding of how various factors contribute to their success as an educator.

Data Collection Methods

In qualitative research, the researcher is the primary instrument (Lincoln & Guba, 1985). As the key instrument for research inquiry, I acted as the social interpreter that seeks to discover meaning of events for the people who experienced them (Patton, 2002). In this study, the data collected was used to understand and interpret the findings (Merriam 1998). Qualitative research is an attempt to understand specific interactions that occur within a particular situation (Patton, 2002). Merriam (1998), detailed that as a researcher there are three conventional methods to collect interview data: tape recording, note taking, and recalling after the interview. Interviews assist in comprehending the complexity of society as it relates to the studies anchors through the lens of the informant (Merriam, 1998).

Interviews

Interviews are used to assess people's experience and their attitudes in addition to their perceptions of reality (Spradley, 1979). Patton (1990) outlined three types of qualitative interviews: informal/conversational, semi-structured and standardized, open-ended interviews. Semi-structured interviews were used in this study.

A semi-structured interview allowed the teachers participating to answer the sub questions in narrative form. A semi-structured approach was chosen to ensure that interview data provided would be necessary to accelerate an understanding of their lived experiences (Creswell, 2007). The interview questions focused on the main anchors for the study: race, teaching identity, STEM, and intersectionality and how these things all are connected.

The semi-structured interview acted as an opportunity for me as the researcher to build a conversation through the examination of questions that will emerge and ultimately provide a deeper understanding of each teacher's experience. Interviews were conducted in a secure place located on their campus to give them a level of comfort. With permission from each of the teachers, all the interviews were recorded using an audio recorder. This was to ensure all interview transcripts were as accurate as possible; there was no compensation for any of the participants.

Each interview was conducted using the same interview protocol. Interviews were conducted on the respective campuses. Each interview is expected to last between 60 – 90 minutes. Audio recordings were made of the interviews to ensure reliability of the data. The audios were stored on a flash drive and locked away.

Teacher Demographic Form

A teacher demographic form was completed by each participant prior to the start of the interview. This form included questions regarding the participants' grade level they teach, gender, content area, years of teaching experience and types of schools they have worked in. After the interview, the participants were given a final chance to review the demographic form to ensure the information documented was correct.

Journaling

Journaling is a vital component of the qualitative research process and plays a crucial role in this research. This method can provide reflective context in which the researcher exposes hidden beliefs, values, and assumptions about the research process. The purpose of the journals was to add to the audit trail which is central to the study. An audit trail allows the reader to trace through a researcher's logic and identify whether the findings can be relied on as a frame for future studies or inquiries (Lincoln & Guba, 1985).

Observations

Observations were conducted at the campus during the interview process. Detailed notes were also kept through each of the visits to the two campuses. Observations of people, places, facilities, and other components were recorded in the reflexive journal (Lincoln & Guba, 1985).

Nonverbal factors that were recognized throughout the interview process were noted as well. These observations provided additional information regarding social interactions that occur on campus when asked about certain questions. Observation

analysis will provide fundamental data necessary to understand the cultural contexts of participants and the campus they work on (Spradley, 1980).

Informal Conversations

Initiating a conversation with a person has been recognized as a fundamental part of qualitative research for decades. Conversations were noted as a method and a core element of social inquiry in early methods during the 1920s and 1930s in both the UK and the US (Webb & Webb, 1932). Many qualitative researchers who choose to interview people will be familiar with the story of what occurs and the participant begins speaking again disclosing things that were not included in the formal interview, opening in a more comfortable way talking in greater detail about the topic (Warren et al., 2003).

Even though the data may be more rich and valuable Swain and King (2022) offered implications that can be made as the researcher after the interview concludes such as closing the conversation by signaling it is time to leave, telling the participant(s) that their continuing thoughts are interesting and asking would they mind if recording resumed, informing the person that they can keep speaking but the researcher may begin to take contemporaneous notes, or allowing them to continue to speak and notes are recorded immediately following the conversation detailing as much as the researcher can accurately remember.

One of the methodological questions asked when it comes to informal conversations is how a researcher reacts to the chance or surprising occurrences that may not have been predicted or covered in the pre-prepared ethical review. Another question concerns the status of the data captured and reported from informal conversations as

opposed to recorded interviews. Ultimately, when researchers are carrying out naturalistic fieldwork, they need to be able to make on the spot decisions about whether to take the opportunity to further communication (Guillemin & Gillam, 2004). Swain and King (2022) promoted a greater use of informal conversations in qualitative research and shows how it can assist in data generation to enhance findings.

Informal conversations can be a factor in decreasing the imbalance between the primary investigator and those being studied. Swain and King (2022) believed that they made new conceptual distinctions between accidental moments and opportunistic moments. The hope is that these new terms will behoove future researchers and become a staple in qualitative vocabulary.

Data Analysis Steps

In qualitative research, data analysis involves the organization and interpretation of data in a way that allows the study findings to be communicated with others (Bogdan & Biklen, 1998). All the interviews in the study were semi-structured, audio recorded, and transcribed. Qualitative data analysis is a thorough search for concepts and themes. Lincoln and Guba (1985) insisted that data analysis requires expert like interpretation and handling of the data and relies on a rigorous and systematic method.

Content Analysis

For this study, content analysis which is a unitization of data was used after the data's transcription (Lincoln & Guba, 1985). After the unitization process, the data was printed on index cards for additional analysis. The task of categorizing data was intended to bring data together into interim categories that relate to the same content to create rules

that describe category properties and can be justified to provide a basis for later tests or replication, and to render the category set internally consistent.

Ultimately, content analysis is data reduction and sense-making efforts that takes a portion of qualitative material and identifies essential consistencies and meaning (Patton, 2002). It was also more than simply counting words or altering pieces of content from the text to explore themes, it allowed me as the researcher the researcher to understand the social constructions of reality in a subjective but measurable matter. For this study, content analysis was achieved through data unitization of each interview transcript. Once this occurred, the process of coding took place.

Coding

This study employed a constant comparative methodology of data analysis. The constant comparative method is a way to generate categories of qualitative data by comparing newly identified words and phrases from the data with previously identified words and phrases (Fields, 1986). Creswell (1998) however, defined constant comparative method as the process of taking information from data collection and comparing it to developing categories.

This most important aspect of this method is that by doing this procedure, both commonalities and the differences of words and phrases are recognized by the coder. After the category is full, which will be defined by the criterion rule of redundancy, it will be considered complete. Corbin and Strauss (1990) outlined their approach to coding using grounded theory as the method to derive new theories and concepts rooted in data,

in contrast to other methods where one may begin with an existing theory and determine whether the data applies to theory.

The purpose of coding is to not describe but attain new understanding of a phenomenon of interest (Hoepfl, 1997). The coding process involved an organization of data from the interviews into categories which will be outlined in a way that prompts significance to the statement (Maxwell, 2005). Open coding allowed me as a researcher to emphasize salient words and phrases that may be clustered to identify patterns and create categories (Strauss, 1987). Given the context of this study, content analysis facilitated development of categories. This process provided fragmentation of data to assist in identification of categories and subcategories. Open coding was intended to open new theoretical possibilities after this first engagement with the qualitative data. From breaking up the data and labeling them with codes it enabled me as a researcher to continuously compare trends within your data. I did this by collating the pieces of data that were labeled with a certain code.

The next step of coding was axial coding where I found connections and relationships between codes and aggregate and condenses into broader categories. In contrast to open coding where data is broken down into isolated parts, with axial coding I began to read over the codes and underlying information to better understand how the codes can be clustered into categories. A category was created based on an existing code and in some cases I created a new category that comprised a host of different codes. Following the axial coding I had several categories that were supported by a combed

through set of codes which are known as the “axes” which its supporting code revolves around (Saldana, 2009).

Selective coding was the last step in grounded theory where I connected all categories together around a core category. Selective coding connected the categories I developed from my qualitative data in the previous coding cycles. The core categories I developed during selective coding came from elevating one of the categories from the axial coding (Corbin & Strauss, 1990). Selective coding is the culmination of the grounded theory process, and its overall purpose is to either define a new theory or modify an existing one (Corbin & Strauss, 1990).

Conceptually Clustered Matrix

In tandem with content analysis as a method of analyzing data, a conceptual matrix was used to assist in the data analysis process. This matrix allowed for unitization of data and assignment into numerous themes. The purpose of the conceptual cluster matrix was to delve into relationships and explain the links among the concepts in the study (Miles & Huberman, 1994). Miles and Huberman (1994) explained that a conceptual cluster matrix is embodied by the general themes, the participants and their comments, and possible connections inherent in the data. This was vital to this study because according to Strauss and Corbin (1990), the conceptual matrix will facilitate my examination by exploring emerging patterns and evaluate the wide range of conditions related to the data.

Assuring Trustworthiness, Credibility and Bias

To ensure credibility and trustworthiness of this study, I utilized individual interviews, participant demographic data, and field notes. The field notes were generated immediately after each interview. Establishing trustworthiness in this study required that I prove credibility, reliability, dependability, and transferability (Lincoln & Guba, 1985). As a researcher I considered four categories to assess trustworthiness of this study: (a) truth value, (b) applicability, (c) consistency, and (d) neutrality.

Truth value was achieved through member checks and peer debriefing. Member checks is the process whereby data, analytic categories, and conclusions are tested with members of those stake holding groups from whom the data was initially collected. Member checks occurred throughout the study to ensure the truth value of the shared experiences and interpretations by me as the researcher. Member checking allowed participants the opportunity to clarify any vague statements. Peer debriefing was also utilized to strengthen the trustworthiness of the study.

Peer debriefing is the use of an external expert who checks on the inquiry process (Lincoln & Guba, 1985). The peer debriefer met periodically with me as the researcher to share thoughts on the sampling and data analysis process while simultaneously offering suggestions on which way the study should proceed (Schwandt, 2007). The debriefing process in this study was conducted with the dissertation committee chair. The debriefing sessions were focused on addressing questions that concern the aim and scope of the study.

Applicability was addressed through transferability. Transferability is the extent to which research findings can be applied to other settings. This is supported by thick description. Geertz (1973), noted that thick description is not a matter of amassing pertinent details but more so to examine social interactions, which is done by recording meanings, intentions, and strategies.

One of the key aims of thick description is to examine social interaction which is accomplished by recording the social circumstances, meanings, and motivations that characterize a specific social occurrence. Patton (2002) claimed that thick description gives the foundation for qualitative analysis and reporting. He also asserted that a good description will take a reader into the setting of the study being described, which promotes better understanding of the phenomenon. Thick description also adds to the detail of the environments being researched and to the participants interactions and experiences (Flowers, 2021).

Consistency is addressed by audit trials. An audit trail is a recorded documentation of the research and methodology process (Gall, 1996). This audit trail in this allowed for management of various data to create trustworthiness. An audit trail is a method of checking data from a variety of sources including journal entries, observations, and interviews (Lincoln & Guba, 1985). The audit trail in this study also allowed for management of various data forms to produce trustworthiness.

Neutrality is addressed through member checks and peer debriefing. One of the key advantages of member checking is at the end of the study more will be known about the phenomenon and as the researcher is an opportunity to present an organized

document for respondents to review. Member checking involves feedback from study participants about the data and study conclusion (Guba & Lincoln, 1985). According to Miles and Huberman (1994), this feedback can be solicited in various ways at different points within the study.

Member checking was conducted at the early stages of this study by giving the transcribed interviews to participants and giving them the opportunity to check for accuracy in the recollection of their responses. An advantage of conducting member checks at the end of this study was that more was learned about the phenomenon, and I presented a detailed and organized document for respondents to review. At this stage, I received feedback at an advanced level of conclusion than can be accomplished through the review of individual interview transcripts or field notes (Miles & Huberman, 1994, p. 276).

To maintain reliability, I used the same questions in each of the interviews. This promoted consistency among what each professional was asked. Transferability was established through my writing which described the data I compiled. I used a reflexive journal and subjectivity statements to capture any assumptions or other matters of subjectivity that I had while conducting the study.

After each interview, I gave participants the opportunity to elaborate on any information provided. To construct narratives that provided a different point of view to each teacher's experience, it was inevitable that some selectivity would take place. According to Clandinin and Connelly (1990) it is impossible to avoid all together. Each

participant was given the opportunity following their interview to review their teacher profile for accurate character description.

As a researcher, I naturally carry my own individual experiences to studies. My background experience in education as a college and career advisor, who promoted STEM industry pursuance amongst middle schoolers, can be considered bias and must be eliminated from the design. In qualitative research, it is not unusual that the researcher's own experiences provide context for understanding. Tillman (2002) notes that to create a paradigm shift, one's cultural experiences can be a tool to deal with culturally sensitive issues; therefore, by recognizing my experiences as a Black male who worked in middle school settings and was exposed to different STEM settings, I am more vulnerable in my articulation of the perspectives of these teachers. Generating what Tilman (2002) expressed as opportunities to show the complex challenges of African Americans, I used critical subjectivity to guarantee trustworthiness, and credibility are maintained.

Chapter Summary

This chapter summarized the qualitative methodology approach that was utilized to examine the experiences of African American middle school STEM teachers. A multisite case study approach in tandem with narrative analysis was employed at two campuses with four participants. Data was collected in the form of interviews, demographic characteristics of participants, and journals by me as the lead researcher. While collecting data I interacted with teachers who signed consent and permission forms pre-approved by the IRB at Prairie View A&M University.

CHAPTER IV

FINDINGS

The purpose of this study was to explore the influence of race on participants' professional identity as middle school STEM teachers in the P-12 context. The data presented in this chapter was collected over the course of the beginning of the academic semester at two South East Texas school district campuses. For this research, pseudonyms are used to define the campuses and the school district. The school district is referred to as the Red School District, and the pseudonyms for the campuses are Campus Blue and Campus Purple. To gain a better understanding of the African American middle school STEM teacher, qualitative methods were used to explore the experiences of eight teachers. The main question that guided this study:

1. *Does African American (racial identity) influence STEM teacher success in the middle school classroom context?*

This chapter provides context of the participants, details of the data and the analysis process and concludes with a discussion of the findings. Qualitative research relies on substantive descriptions, background information on participants, and characteristics of the sites for the study. Patton (2002) noted that thick rich descriptions offer a base for qualitative analysis and reporting. A good description allows the reader to dive into the settings described to better understand the phenomenon studied and help comprise their own interpretations about meanings and significance of the findings.

Description of Participants

Participants were chosen based on criteria established by the researcher: African American, experienced middle school teacher, and teach a STEM subject. The information provided on their demographic forms (Appendix B) indicated whether they met the requirements. Figure 3 shows a chart of all the participants' demographic features. To protect the identities of the participants they are identified using pseudonyms. Their color represents their campus as noted in the chapter, Campus Purple and Campus Blue.

These eight educators believed in the power of education, and all attributed their success to different reasons. Out of the eight participants in the study six of them identified as female. This overwhelming number of female educators in the study is a replica of the current educator workforce as there are more women teachers than there are males. Colleges began enrolling women in the mid-19th century and while the earliest undergraduates were anticipated to use their degrees, there was a critical need for schoolteachers in public education. Given the belief that women were more nurturing than men, women have always been encouraged to enroll in teacher and education-based programs at the expense of other majors (Carroll et al., 2021).

Table 3: *Participant Demographics*

	Gender	Years of Experience	Subject and Grade Level
Purple 1	Female	24	6 th Grade Math
Purple 2	Female	3	8 th Grade Math
Purple 3	Female	15	7 th / 8 th Grade Robotics
Purple 4	Male	11	7 th Grade Math
Blue 1	Female	17	7 th Grade Math

Blue 2	Female	9	6 th Grade Math
Blue 3	Male	30	8 th Grade Science
Blue 4	Female	29	6 th Grade Science

Data Analysis

This study examined the ways in which African American middle school STEM teachers defined success based on key life dimensions that included race, identity, and their teaching identity. The data were generated through examination of the participants demographic forms, individual interviews and observations that were made in the interview setting. These methods of data collection were employed to understand how the different dimensions of teacher identity play into their success as STEM teachers.

The participants were all asked the same six interview questions:

1. If you had to explain your identity, how would you describe it?
2. If you had to explain your identity as a teacher, how would you describe it?
3. What are the top three descriptive terms to describe your teaching identity?
4. Does race play a role in your success as a STEM teacher?
5. Does race influence your teaching identity?
6. How do you define success as an African American STEM teacher?

These questions were strategically curated to reflect the guiding theories for the study: Critical Race Theory (Bell, 1980), Identity Theory (Freud, 1923), Teacher Identity Theory (Watson, 2006), and Ecological Systems Theory (Bronfenbrenner, 1983). After the interviews were completed, they were transcribed using Microsoft Word. The audio from the recordings was transcribed into a word document and I listened to each interview again to correct any miswording or incorrect spelling or grammatical errors.

The audio recordings yielded 24 pages of data collectively. Each transcription was coded specifically by their campus and participant pseudonym. This allowed me the opportunity to keep the data sorted and it was easy for me to refer to when needed. The ultimate reason for transcribing my own data was because I went through such an arduous process to complete all the interviews, I wanted to ensure that the data was properly documented. It also allowed me to gain a better understanding of my content and make immediate connections to other components of the research process such as the literature review and implications for future research.

Following the transcription, the data were analyzed via open coding (Corbin & Strauss, 1990) using Chat GPT. Chat Generative Pre-Trained Transformer is a language model based chatbot developed by OpenAI. Open AI is an artificial intelligence company whose mission is to ensure that artificial intelligence benefits all of humanity. Open coding is where the material from the interviews were coded without a pre-defined code list and acts as an inductive approach to allow the data to speak for itself (Mishra & Dey, 2022).

Open coding was followed by axial coding. Axial coding is a research technique that involves relating data together to reveal codes, categories and subcategories (Mirsha & Dey, 2022). The final step of the coding process was selective coding. This was the act of me choosing a core variable or concept among the existing categories I created from the axial process to start curating overarching themes that arise from the data and addresses the research question.

Table 4 shows a visual representation of the coding process. The open coding column does not show an exhaustive or complete list of all the open codes, but it includes a majority of them as they were subsequently broken down and grouped together in the axial coding column. Lastly, the selective coding column offers the name of the theme for that specific set of data.

Table 4: *Themes*

Interview Question	Open Coding	Axial Coding	Selective Coding
If you had to explain your identity, how would you describe it?	<ul style="list-style-type: none"> • Male • Female • African American • Jamaican • Husband • Wife • Cancer Survivor • Doctoral Student • Daughter • Uncle 	<ul style="list-style-type: none"> • Educator • Race/Ethnicity • Gender • Family Role • Life Experience • Age 	Identity v. Experience
If you had to explain your identity as a teacher, how would you describe it?	<ul style="list-style-type: none"> • Belief in the potential of students and the importance of confidence-building • Challenging assumptions and biases, especially regarding race and teaching roles • Belief in expanding students' horizons and critical thinking skills • Recognizing the need for different approaches based 	<ul style="list-style-type: none"> • Continuous Learning and Adaptation • Student-Centered Approach • Coach and Holistic Approach • Addressing Identity and Stereotypes • Empathy and Flexibility • Enthusiasm for Specialized Training High Standards and Consistency 	Teaching v. Identity

	<p>on students' backgrounds and needs</p> <ul style="list-style-type: none"> • Encouraging diversity of thought and fostering an inclusive environment • Creating an environment where students can share their perspectives and approaches • Focus on closing gaps and making learning sustainable over time <p>Using data to support teaching strategies and improve learning outcomes.</p>		
<p>What are the top three descriptive terms to describe your teaching identity?</p>	<ul style="list-style-type: none"> • Welcoming • Flexible • Relatable • Engaging • Intuitive • Easygoing • Enthusiastic • Fun-loving • Playful • Strong Work Ethic • Strict • Unyielding • Invested • Challenging • Hardworking • Knowledgeable • Informative • Super Planner • Invested • Challenging 	<ul style="list-style-type: none"> • Positive Qualities for a friendly environment • Dedicated and demanding work environment • Efficient and Competent or Professional Environment Leadership Centered Environment 	<p>Who I am v. The Classroom Environment I Foster</p>

	<ul style="list-style-type: none"> • Fair • Supportive • Encouraging • Motivating • Consistent 		
Does race play a role in your success as a STEM teacher?	<ul style="list-style-type: none"> • Acknowledges that race plays a role in their success as a STEM teacher, especially in terms of representation and proving themselves. • Cultural background and home culture help them connect with students who share a similar background • Challenges of teaching non-English speaking and culturally diverse students, highlighting the need for extra effort in some cases • Shares experiences of students feeling more connected to teachers who look like them, emphasizing the importance of representation Importance of motivating students to believe in themselves and not let external 	<ul style="list-style-type: none"> • Perceived Impact of Race on Teaching Success • Connection Between Culture and Teaching Success • Language and Culture Barriers • Mentoring and Representation • Teaching Strategies Based on Race and Learning Styles • Perception of Diversity Initiatives • Influence of Teacher's Race on Student Connection • Community and Support in Predominately Black Schools Empowering Students to Overcome External Factors 	Race v. Success

	factors deter them from their goals		
Does race influence your teaching identity?	<ul style="list-style-type: none"> • Race can influence teaching identity, especially in relation to minority students, and the need to address educational disparities • Powerful impact they have on African American students due to the smaller population and the success stories of their students • Discusses various teaching strategies, including visual, kinesthetic, and auditory approaches, tailored to the diverse learning needs of their students Highlights the significance of having teachers who look like and relate to students, especially for minority students 	<ul style="list-style-type: none"> • Influence of Race on Teaching Identity • Impact on African American Students • Race and Success in STEM Teaching • Teaching Strategies • Representation Matters • Community and Support Motivation and Encouragement 	Race v. Teaching Identity
How do you define success as an African American STEM teacher?	<ul style="list-style-type: none"> • Promoting continuous learning and improvement. 	<ul style="list-style-type: none"> • Identity as an Educator • Descriptive Terms for 	Success as a Multidimensional Concept

	<ul style="list-style-type: none"> • Encouraging critical thinking and questioning. • Embracing best practices from various cultures • Motivation driven by inspiring students in STEM fields. • Pride in students' achievements and career choices The significance of students returning to share their success. 	<p>Teaching Identity</p> <ul style="list-style-type: none"> • Role of Culture • Race and Success as a STEM Teacher • Success Metrics Motivation and Impact 	
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Because the context of this study focused on the experiences and dimensions that lead to success in African American middle school STEM teachers, each participant provided thorough responses to each interview question. The following sections provide a detailed discussion of each of the themes discovered and summarize the responses by the participants. Throughout the section, quotations from the participants responses provide the context of the participants experiences and other pertinent information related to their answers.

Themes

Theme 1: Identity v. Life

This theme was supported by the conceptual framework of Identity Theory (Freud, 1923). Within this theme participants spoke about the components that they felt defined themselves. Participants in this study were asked six questions about part of the data collection process. Their first question asked them how they identified. The

participants each displayed four of the main tenants of Identity Theory identified by Burke and Sets (2009) which included concepts of the mind, understanding of self, distinction between signs and symbols and the concept of significant gestures.

The participants' sense of self-awareness in the interview led them to act in a certain way as they were wanting to achieve the end goal of making sure they answered the question. Participants immediately began describing their identity leading with factors such as their race and gender. Some participants were more transparent and identified with the factors that could not be seen by looking at them. Participant Purple Two said, "*I would describe it as being very resilient. Honestly, being African American does come with its challenges, its benefits and its deficits*" (personal communication, September 5, 2023). Participant Purple Four said, "*I am a Black father, a Black husband, a Black teacher*" (personal communication, September 5, 2023). Participant Purple One said, "*I am a middle-aged African American female that is an educator*" (personal communication, September 5, 2023).

Participant Purple One said, "*I am a recent cancer survivor. You know, I'm grateful for each day. You know, I truly have a newfound appreciation for life, and I know that each day is a gift and a privilege*" (personal communication, September 5, 2023).

Participant Purple One identifying as a cancer survivor and disclosing how that impacted her outlook on life immediately set a precedent of comfort within the interview. It made me believe as the researcher that my initial introduction of myself and the study provided the foundation for her to offer such a pivotal response as to how she identified.

Regarding Identity Theory, identities are a set of meanings that are used to define people and one of those identities are person identities (Burke & Sets, 2009). This meaning is associated with a distinct quality or feature that distinguishes someone from others. While this participant was one of the six females interviewed, her including cancer survivor as part of her identity immediately set her apart from the other participants who identified as female or taught the same subject as her.

There were two males interviewed in this study and they both led with race as their primary identifier. When Participant Purple Four was asked the follow up question of which dimension of his identity was most prevalent to him, he stated, “...*it’s being Black. I am a Black father, Black husband, Black teacher*” (personal communication, September 5, 2023).

This emphasized that whatever role he played in his life his race depicted that role in his life as it pertained to himself and others. This statement from Participant Purple Four acknowledged a proximal social structure because the identity prominence of him being Black is pivotal in his everyday interpersonal interactions and offers context in which he fosters social relationships among friends, family members, coworkers and students (Merolla, 2012; Serpe, 2019).

This data suggested that the foundation of the participant’s identities was rooted in factors that were both identifiable and unidentifiable to the human eye. It is also clear that race set the precedence for how they identified in every other dimension within their specific worlds. Participants made it clear that their main identifier was their race, and that their race impacted their other social identities.

Theme 2: Teaching v. Identity

Theme 2 was Teaching v. Identity. The second question of the interview asked participants to describe their teaching identity. For this research, teachers with only three or more years of experience were chosen. Collectively the educators spoke to their personal philosophies of teaching while bridging the gap of other identities to describe their teaching identity. Their teaching identity was directly connected to their personal, professional, socio-political and cultural dimensions.

Continuous Learning and Adaptation

One of the categories that repeated themselves during interview question number two was the need for continuous learning and adaptation. There was an emphasis on adaptation to changes in education as the world recently shifted following the COVID pandemic in addition to the changes the Red School (a pseudonym) faced given the state takeover. The takeover caused major shifts in district leadership in addition to overall curriculum for students at all levels. The teachers also spoke to using data to support teaching strategies and improve learning outcomes. In a data driven school, these teacher's focus was on closing gaps in learning and making said learning sustainable over time. Participant Blue Two said,

Human nature, we just want to work on the things we're good at and not strengthen the things that are areas of weakness. So, to fully answer your question and wrap back to that. I would say, as a teacher, I identify again with coaching, but really looking at taking a holistic approach. A lot of these kids at this age level just lack confidence. They just want someone to talk to. So, taking the

holistic coach approach, strengthening or targeting your weaknesses to strengthen those. (personal communication, September 28, 2023)

Student-centered Approach

Viewing students as intelligent and capable individuals is important to a teacher who has and is developing their identity as an educator. Participant Blue One stated,

I always tell my students that you're younger, so you're smarter. And so, because I always reinforce that if I make errors, it's acceptable to them. I'm not the smartest person in the room. I am more of a facilitator for them, and I try to guide their learning and allow them to share their ways of doing things. (personal communication, September 28, 2023)

This type of connection made with the students created an environment where they could share their perspectives and approaches. This student-centered approach speaks to the ongoing process of interrelating multiple positions in a way that is coherent (Day & Flores, 2006).

The student-centered approach is also rooted in encouraging diversity of thoughts and fostering an inclusive environment. For example, in her interview, Blue One offered an anecdote of how a student explained another way to solve fractions and how she encouraged this student to share that thought process with the rest of the class to support new ways of thinking outside of the textbook. Participant Blue One stated,

For example, this morning I went into the teachers' room and the students were doing fractions and decimal percent and I asked how did you get the 80%? And he said to me, well 4 times 5 is 20, each part is 20. So, all I must do is multiply 4

by 20. It's different, right? Some kids would say, you know you divide and that's okay because that's one way. But I like the way he was thinking. And so, I encouraged the teacher to have him share that out with the classroom. So, it's interesting to see the process. (personal communication, September 28, 2023)

Coach and Holistic Approach

Identifying with a coaching approach to teaching was the result of a study participant who played sports most of their life. This coaching approach is centered around the importance of confidence building. In education, a holistic approach allows the educator to approach teaching in a way that involves educating the whole learner which can include their physical, emotional, social, moral, and spiritual aspects. This directly correlates to one's teaching identity because it proves that teaching is more than a technical process but a complex, personal and set of instilled processes that involves their entire being (Olsen, 2018).

Addressing Identity and Stereotypes

Part of their teaching identity as it pertained to race came with addressing issues related to identity and challenging assumptions and biases relating to their positions. There is a disproportionate number of African American teachers compared to their Caucasian counterparts and there is an even smaller number of African American male teachers. Given this small percentage, Black male STEM educators feel they must work harder and promote higher standards with their students. Participant Purple Four stated,

I hold my students to a high standard. Because I feel that at times when I received that as a student myself I did better than when teachers did not possess those

qualities or did not expect those things of me, especially from those teachers who didn't look like me. (personal communication, September 5, 2023)

The assumption that Participant Purple Four was not expected to meet or perform at high academic standards due to his race is reflective of the Critical Race Theory standpoint that without the background knowledge regarding issues of education inequalities, these issues will be seen as new problems as opposed to the expected outcomes of deliberate procedures and practices (Taylor, 2009). To fully understand CRT, it is vital that one is aware of the inequitable educational opportunities between opposing races through the analysis of historic lens. This participant offered the implication that there would be a pattern of low morale or lack of support for students of color at the hands of White teachers if he had not been in the role to push them forward and higher.

Empathy and Flexibility

One thing that comes with being an experienced teacher is developing a sense of understanding with students and being able to allocate space to take on other roles in the spur of the moment to ensure that students receive whatever information is distributed. This includes recognizing the need for different approaches based on student's backgrounds and needs. Participant Purple Two directly resonated with this category as she said, "*...I understand because, working in the school that I'm in, my kids come from all different backgrounds. I am a different teacher to every kid, so I must be empathetic*" (personal communication, September 5, 2023).

As a researcher, I think she identified with the empathy and flexibility component because she was the youngest participant interviewed and I know firsthand as a young researcher how one can crave peers or colleagues to empathize with them when they are in shared spaces, or they require a little more assistance. Her response indicated that she represented that empathy amongst her students.

Enthusiasm for Specialized Learning

STEM education was conceptualized during a period in history where education inequalities based on race and gender were at an unrelenting high. The eagerness to teach a specialized subject like engineering or technology or a core subject as math or science, stems from a place in history where African Americans could not even learn these subjects. This category is imperative to the overall theme because it helps educators get to a place where they can empower students to understand and navigate the world around them. I believe as an educator there is this unspoken responsibility to expand student's horizon and their critical thinking skills. Participant Purple Three discussed why teaching robots is so important. She said,

Well, many times, our [Bl]ack and [B]rown students don't have the opportunities because of their environment or where they live or where they're from to experience a lot of things that their counterparts being those students who are of the Caucasian persuasion... Because we do robotics and engineering, they're able to enhance their critical thinking skills. (personal communication, September 5, 2023)

This point of view supports the general teaching identity framework by promoting two of the five repertoires: caring-for-others and making a difference (Golzar, 2020). This represents an advanced degree of positive change during the teaching experience through unanimously wanting to impact the learners and make a difference in those receiving instruction.

High Standards and Consistency

Setting and holding students to a higher standard is often more reflective of the teacher than it is the student. These Black educators collectively expressed the need or desire to push their students to perform well as a reflection of their teaching efforts. There was also a shared belief in the importance of consistency and high expectations for student success. While I have never been a teacher, I did obtain a role in education where I was responsible for delivering curriculum to middle students as a college and career advisor. Given the racial diversity amongst my coworkers in tandem with me being the youngest person in my department, there was this unspoken sense of pressure to perform at a high level in comparison to my peers.

As a former educator I identify with the research participants' desire to perform at high standards due to my race among other subsequent factors. I think based on the data, they performed at a high standard because they do teach at campuses that serve predominately Black and Brown students to set the standards for what they can achieve and more importantly prepare them to compete and engage with others at a global level. This is important because it plays a role in their professional identity.

Theme 3: Who I am v. The Educational Environment I Foster

Theme 3 analyzed the way teaching identity intersected with the pedagogy and practices of the profession. When asked to describe their teaching identity using three descriptive terms, each participant provided three adjectives and terms. Once all 24 words were collected, they were categorized based on similarities of the words. It was important to understand the type of environment they created in their classroom because it was incorporated with their identity. Teaching is an ever-changing and malleable construct that may reiterate that identity is not static and changes through their personal and professional lives (Golzar, 2020). The terms used to describe their identity as a teacher were reflective of several factors including but not limited to years of experience, age, experiences during their career, the types of students they dealt with, and their evolution as a teacher.

Summary

The environment these students are in was created by their teacher and the environment was a direct reflection of classroom practices and teaching styles. Kanno and Stuart (2011) found that classroom settings play a role in teacher identity development due to the interwoven affiliation between identity development and classroom practices. Simply put, classroom practices in tandem with classroom settings, help teachers foster their teacher identity; mutually supporting them in their teaching practices. Because they teach robotics and engineering, they are able to enhance their critical thinking skills.

Theme 4: Race v. Success

Critical Race Theory was at the foundation of this theme within the research and the question that brought it to the forefront because exploring education through a lens of CRT directly acknowledges the voices of minorities that cannot be heard (Ladson-Billings, 1998).

Perceived Impact of Race on Teaching Success

Most of the participants felt race played a role in their success as STEM teachers especially in terms of representation and proving themselves. In a school district where there are more Caucasian educators than Black educators, could be challenging for some but to be on a campus where there are equal or more White educators prompts another level of drive to subconsciously aim higher in goal achievement. Participant Blue Four detailed the perceived need to work harder due to the skepticism of her capabilities in her role especially considering her advanced level of education. She stated,

...they look at you and they're challenging you asking what do you know? Do you know the subject? And you know, we have some kids that think they know when they try to challenge you” As an educator, to have a student attempt to question a teacher’s skillset may elicit a different type of frustration or fuel to succeed because there are now individuals on both end of the education spectrum questioning capabilities based on race. (personal communication, September 28, 2023)

Mentoring and Representation

The importance of being a role model was something that emerged as a recurring expectation in the data. This was particularly noted in both interviews with the male participants who also shared the identity of being Black fathers. Participant Blue Three stated,

Race plays a big role in my success. In terms of teaching inner city, I think I'm able to give my kids an opportunity to interact with someone who has gone on to college and that allows me to give them a lot of insight into what to study, what to prepare for high school and for college. (personal communication, September 29, 2023)

The underrepresentation of Black male teachers in the U.S. public school system is a pervasive issue that is still trying to be addressed on multiple levels. Despite the need for Black educators, there is a dire need for Black male teachers in the education system (Carter Andrews et al., 2019). Participant Blue Three stated,

For example, over the years of teaching in the Red School District (pseudonym) for this long in some situations, I'm still addressed as coach. It's always assumed that I teach PE. I've walked the halls of RED SCHOOL DISTRICT and I've had people speak to me and ask how you doing, coach? And it is so insulting. Not that teaching, you know, physical education is insulting, But the simple fact that you see a big head, big shouldered, black man walking down the hallway and you automatically assume that he teaches physical education. (personal communication, September 28, 2023)

Given the assumption or notion that Black educators have had similar life experiences to their students, it is proven essential that Black educators are seen as role models for those students within the same minority group (Alexander, 2022). Yet, establishing a connection between CRT and education, Fultz (2004) noted that specifically in the southern region of the United States, as is the Red School District, strategies have been used to repress the representation of Black educators. These strategies include but are not limited to decreased compensation, poor recruitment efforts, unjustifiable excusals, and compulsion to subjects other than those that Black educators were prepared to teach (Fultz, 2004).

Perception of Diversity Initiatives

Some Black educators report that there is naturally a skepticism that follows them through their career as it is often believed that while race may have opened the door, the work ethic and quality of the job being done is keeping them in the positions. This was especially clear amongst the Black female participants in the study. Teaching is notably a solid profession among some African American women given their capacity to transcend obstacles and display complex concepts to students while simultaneously providing nurturing and mentoring (Kotler-Snyder, 2023). This nurturing can look like many different factors including realizing and providing opportunities to students who struggle with factors out of their control. One of those can be a language barrier. Participant Blue Four shared a narrative during her interview where she had to offer more on the spot emotional support to students, she believed was struggling but quickly learned did not speak English.

Community and Support in Predominantly Black Schools

Amongst the participants, there was spotlight on the sense of community fostered by race which supports a common vision that positively impacts students. While it has been argued that many Black teachers do not enter teaching due to poor experiences in school, these are the same experiences that shaped their views on the teaching profession and their decision to go into the field of education (Gordon, 1994). Participant Purple Four stated,

I am very serious and here's why, I come from the perspective of having two teachers that truly left a mark on me for life. I mean, it forever changed the person that I am because of these two teachers. And when I say that I don't mean in a good way. These two teachers left me with such a traumatic experience. A second-grade teacher, 9th grade computer teacher. I never want to be those two teachers. So truly my 24-year philosophy has been to never be a student with those two teachers. (personal communication, September 5, 2023)

According to Lewis (2022) mixed methods surveys in tandem with integrative synthesis studies have highlighted the importance of Black female educators on classroom and student experiences. Participant Purple Three stated,

Well, many times, our Black and Brown students don't have the opportunities because of their environment or where they live or where they're from to experience a lot of things that their counterparts being those students who are of the Caucasian persuasion...So, when we're able to bring these kinds of programs and these kinds of activities into the communities of our Black and Brown

children their horizons of life, their knowledge is expanded because there's a lot of things that they don't even know exist. (personal communication, September 5, 2023).

Being a Black teacher is one-dimension, Black STEM teachers are another dimension, and a successful Black STEM teacher deserves accolades. From adapting teaching strategies to accommodate different types of learners in their classroom to demonstrating transparency about the challenges of teaching non-English speaking and culturally diverse students, to other key factors, the participants in this study identified that race does indeed play a role in their success as a STEM teacher. This theme allowed me to further explore the constructs of race and professional identity.

Theme 5: Race v. Teaching Identity

Theme 5 illuminated the meeting points of one's race and their professional identity. Question five of the interviews focused on the tenants of race and teacher identity. Inquiring whether one's race influenced their teaching or professional identity asked them to consider all the experiences they endured during their career. In addition, it asked them to consider whether their race was the primary indicator of how they completed their job and the decisions they made while at work. Research on identity has grown greatly in the context of education but one factor that has remained consistent is that teacher identity is comprised of many dimensions and a key element is cultural dimensions (Watson, 2006).

Impact on African American Students

To be a Black STEM teacher is delivering curriculum to all students but can be accompanied by a higher standard for African American students. Participants discussed the powerful impact on African American students at the expense of their teaching styles. A recent quantitative analysis demonstrated that Black male students with Black teachers had higher test scores than the same population of students with White teachers. Similar findings were discovered for Black female students who had a Black or Hispanic teacher (Yarnell & Bohrnstedt, 2018). Race has proven to have an impact on teaching strategies which is a category within this theme. That is evident by the more experienced participants in the study acknowledging that all students do not learn the same. Adopting culturally responsive practices allowed them to recognize that every student possessed diverse learning needs and therefore, they must cater to all students while simultaneously getting one message across.

Motivation and Encouragement

Black female teachers are often choosing teaching roles that have a direct connection to mothering (Haynes et al., 2020). Many Black woman teachers use the mother-child relationship model as a guide for interactions with their students as a central resistance to patriarchal and racial domination (Beauboeuf-Lafontant, 2002). This was a reoccurring theme that came about in the personal anecdotes that the participants shared.

Black male teachers are motivated to enter the world of education as teachers given their positive experiences with Black male teachers they have encountered (Fray & Gore, 2018). Black educators also reported that as students they were inspired by Black

teachers who doubled as mentors or role models and wanted to emulate their styles of teaching (Miller & Endo, 2005). This works both ways because as previously stated by a participant, a poor experience with an African American teacher was the determining factor in a decision to enter education to ensure future generations did not encounter with the same unfortunate experience. Participant Blue Two stated,

Yes, because teaching, like everything else, is political. So right away when you're Black, you always have something. You always have that monkey on your back to say, and you're always trying to prove yourself. So, with that, I've never worked at a school where it's over 50% Black as a staff. CAMPUS BLUE would be the school I've worked at with the most Black teachers. So, you're always trying to prove that you belong in the room. You should be doing this, and it just makes you want to go hard for the kids. And it influences my teaching even more to be, again, a representative and show these kids, especially my Black students, what's possible for them. (personal communication, September 5, 2023)

Being a STEM teacher is not the same as being a Black STEM teacher. The participants had a mutual understanding that their race preceded their professional identity. This was why there was a need to always differentiate that they are not a teacher but a Black teacher and that is accompanied by different set of trials that only a select few can identify with.

Theme 6: Success as a Multidimensional Concept

While analyzing how the participants defined success as it related to both their racial and professional identity, Theme 6 emerged. The final question of the interview

focused on how participants defined success as an African American STEM teacher. The responses included tenants of race, identity and teacher identity, and the intersectionality of them all. The teachers each exemplified a true dedication to their craft and through the emerging themes in the data, it was clear that they understood their jobs did not end when the students left their classrooms.

Race and Success as a STEM Teacher

Participants viewed their roles and professions as much more valuable than society would like to account for, and rightfully so. They also understood they were only as successful as their students. One of the emerging concepts that helped them measure their success was assessing student growth and empowerment. Participant Blue One stated, *“There are so many different outlets they can get into so. Success is helping to find students find themselves, their purpose, what they can identify with”* (personal communication, September 5, 2023). Empowering students to go beyond their neighborhoods is a measure of success because having experienced similar trials as Black educators, these teachers know what it is possible to obtain.

Success Metrics

One of the success measures of the participants was student outcomes and academic growth. Being able to recognize the growth in students because of their teaching was a consistent data point within the interviews. Teachers defined growth in their students by students who had an increase from the beginning to the end of the academic school year. Participant Blue Four acknowledged student growth as a success metric of hers. Participant Blue Four stated that,

Well, here in RED SCHOOL DISTRICT success is how many students pass that STAAR Test. But for me, it's how many students that I have grown. From day one, when they came into my class. Anybody can take a test. But did you learn some knowledge? What did you learn? (personal communication, September 28, 2023)

Ultimately, she along with other teachers interviewed understood that students are more than their state assessment scores. A student can perform well all year and not perform the best on the test that determines their grade advancement but that does not mean the student is not successful. Participants also looked at success as their ability to help students remain resilient and work through challenges. This encouragement helped students to define their own success. Participant Purple Two stated,

I don't measure my success by numbers. I would say or by the number of students who reach back out to me. So, if students remind me that I really pushed them, or they say last year I feel like my teachers didn't care about me and now I feel like you really do. (personal communication, September 5, 2023)

Motivation and Impact

The motivation to drive students into STEM fields was an element of success amongst the participants. They believed that if they could motivate at least one student into a STEM field they were successful. This also pertained to the students who not only pursued STEM in higher education but success to these teachers also resembled motivating students to pursue higher education in general. Participant Blue Two stated,

Empowering students. Getting them more so to see opportunities that are out there. We are in of course, the age of misinformation. But there's just so many

outlets and educational academic opportunities for students that are beyond....

Success is helping to find students. Find themselves, their purpose, what they can identify with. And I mean this is such an early age, but you just must continue to spark them. (personal communication, September 28, 2023)

Participant Purple Four stated,

I define my success by the number of students who go on to higher learning, who go on to college and Graduate School. I've had students over the years who are attending veterinarian medical school. Working on their masters, engineering students who've gotten involved with programs affiliated for ecology with the University of Texas. And it's been. It's been a nice pat on the back to see those kids go that far and then look back and tell me that, you know, I inspired them to do something in science, in stem. That's really encouraging. (personal communication, September 5, 2023)

Participant Purple Three stated,

That's how you know you have touched somebody if it's not but one student a year. If I can get one student to broaden their horizon to want to major in stem, it makes it makes it better for me. I think the most amazing thing that I've had since I've been here in Houston is that I have my very first class here that has graduated from college. I have one student who graduated from UT San Antonio, and she majored in engineering. She didn't have a clue about engineering before she took the class, but because that interest was sparked, she went on and did her early college program, got her associate degree before she graduated high school

and I keep in contact with her today where she's getting ready to graduate in December and has a job lined up already. (personal communication, September 5, 2023)

Success as a Black STEM teacher can result in a culmination of factors but for this group of educators the foundational grounds for success for them was impact. They were aware of the community they served. They were aware of the difficulties their students faced in and outside of their classrooms, and they were aware that some factors were out of their control. However, ultimately the pride they felt in helping a student become a better person is what motivated them to get up and show up for work every day, thus making them successful.

Chapter Summary

There were six themes that emerged from data analysis. They were: (a) Identity v. Life, (b) Teaching v. Identity, (c) Who I am? v. the Environment I Foster, (d) Race v. Success, (e) Race v. Teaching Identity, and (f) Success as a Multidimensional Concept. While this study examined participants from two different middle schools, it is important to note that similar categories emerged which turned them into themes with regards to the tenants of race, identity, and professional identity.

Using CRT as a framework, I explored in this study an evident understanding of Black STEM teacher experiences concerning the underrepresentation of their presence and how their determination of success was driven by race. Identity Theory as a framework guided the participants to determine the subcomponents of themselves in a particular role and the accompanying expectations that were thought to guide behaviors

(Gecas & Burke, 1995). Teacher Identity Theory assisted in guiding the research analysis as it helped understand participants' intersectional relations to the central aspects of their lives which included their motivation for teaching and measurement of success. The final theory that helped guide the research was the Ecological Systems Theory which analyzed the participants' development within the context of the systems that form their environments.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Although studies such as the one conducted by Lewis (2022), and Strachan (2005) discussed different aspects of educators and their relation to racial identity, little research has examined the how racial identity in tandem with the experiences tailored by one's race help shape their success in their roles as educators. This study was designed to explore how the experiences of African American middle school STEM teachers contributed to their success. Based on the participants responses to the six interview questions, six themes emerged to identify the experiences of the educator: (a) Identity v. Experience, (b) Teaching v. Identity, (c) Who I am v. the Classroom Environment I Foster, (d) Race v. Success, (e) Race v. Teaching Identity, (f) Success as a Multidimensional concept.

Based on the findings, it was concluded that educators must understand the various multidimensional components of their identity like race, social categories, personal traits and values, and life experiences, that influence their success as middle school STEM teachers. Within the findings it was made clear by each participant that race in correlation to their role as STEM teachers was the leading identity factor which led to their success. There is shortage of African American educators and an even smaller percentage of African American STEM teachers, their representation in urban school settings as the Red School District is vital to their commitment as educators.

Relation to Conceptual Framework

When examining the experiences of African American middle school STEM teachers, it is essential to understand how the experiences that lead to their success are influenced by intersection and multiple theoretical frameworks. Four distinctive theories comprised the conceptual framework employed in this study: (a) Critical Race Theory (Bell, 1980), (b) Identity Theory (Freud, 1923), (c) Teacher Identity Theory (Watson, 2006), and (d) Ecological Systems Theory (Bronfenbrenner, 1983). Each of these theories served as a frame to understanding the participant's conceptualization of their experiences. The conceptual framework is reprinted from Chapter 1. Recall that it indicates the intersection of the four theories that comprised the framework.

Figure 1

Conceptual Framework



The components of the conceptual framework led to holistic understanding of success as a multidimensional concept. Based on the participants' conceptualization of

their experiences, the conceptual framework illustrates the connectedness between participants' experiences and these four theories.

Identity Theory

Identity theory is a sociological perspective that focuses on how individuals develop and maintain their self-identity and how it is influenced by social roles and experiences (Freud, 1923). In the context of this study, participants placed great emphasis on their role identity which is how they defined themselves based on their professional roles. This directly aligns with identity theory's concept of role identity where individuals derive a sense of self from their roles in society. For these participants, being educators allowed them to assume so many more roles within their professional context they were able to include most of the traits that overlapped from the intersecting of other social categories.

The participants mentioned different aspects of their social identity. These included their race as African Americans, their gender, their age and other identifiers that made them unique in the sense that the only identity they all had in common was that they were Black middle school STEM teachers. These categories were vital to their self-concept and proved to be consistent with identity theory's focus on social categories as components of one's identity (Burke & Stets, 2009).

As the researcher, it was compelling during the interview process to see participants describe themselves and their experiences because different social categories would take precedence over one another in sharing personal anecdotes. For example, when one participant described her battle with breast cancer, she made it clear that her

gender was most imperative in that context. And when one participant expressed his regret for the different roles he played in his two sons' education, his identity as a parent was the leading social category. Being able to hear the intricacies of the different social categories expressed in one sitting was vital in determining plans for future research surrounding African Americans and STEM.

As the interview questions posed to the participants were strategically curated, the different components and tenants of the various frameworks willingly rose to the top ensuring the line of questioning was effective. One of those tenants within identity theory was identity construction. The interviewees discussed their identity as educators in the context of representing someone they did not have when they were in middle school. This notation is reflective of identity construction as the participants detailed how they created and modified their identities based on their life experiences and social roles. For example, Participant Purple One recalled how her experiences as a student were so poor at the hands of two teachers she vividly remembered, that she chose to become an educator because she wanted to model for students what they do not have to deal with from teachers and to give them the opportunity to grow.

From the interviews, participants provided insight into how they understood their identities incorporating aspects of their roles, social categories, personal traits, life experiences, and identity construction. These descriptions aligned with key concepts within identity theory and highlighted the intersection of the multifaceted dynamics of one's self concept. Intersectionality can be viewed as a tenant of identity theory as it

examines how various social identities and experiences overlap to curate complex experiences of both privilege and oppression (Azmitia & Thomas, 2015).

Teacher Identity Theory

Teacher Identity Theory is the teacher's sense of self in their profession which is comprised of their personal, professional, socio-political, and cultural dimensions (Watson, 2006). Teacher Identity Theory was a leading framework for this study because it allowed me as the researcher to see the direct correlation between identity and professional identity and the way it shapes one's experiences. The constructs of this theory were explored more in Chapter II.

During the interview process, the participants were asked to describe their teacher identity. This showed an overlap to the question surrounding their general identity but given the connection between identity and professional identity it was expected. One of the key tenants of Teacher Identity Theory is that teacher identity formation is continuous, involving both person and context. The participants expressed a commitment to continuous learning and adaptation in the ever-changing world of education. This is in alignment with the idea that a teacher's professional identity is molded by their ongoing development and willingness to adjust their practices based on new insights and knowledge.

Working in education, I have built great relationships with teachers. I have seen teachers grow over the course of an academic year and sometimes even during a semester. So, growth and continuous learning is proven from this study to be a core tenant of Teacher Identity Theory.

The same commitment that the participants had to continuous learning and adaptation is identical to their collective commitment to teaching with compassion. This compassion has been rooted in negative experiences with past teachers which reflects an expressive and compassionate aspect of the teacher's identity. This suggests that teacher's personal experiences and emotions notably impacted teacher's identity and their approach to education (Darby, 2008).

Teacher Identity Theory as a guiding framework allowed me as the researcher to explore the tenants of the framework. One participant spoke about them not judging students and making the conscious effort to meet the students on their level in terms of learning capabilities. This speaks to pedagogical beliefs and approaches to teaching. The idea that teaching identity is intertwined with teaching philosophies and methods is not abnormal (Beijaard, 2018).

As it relates to teacher identity and teaching approach, flexibility and facilitation is a hidden gem within Teacher Identity Theory that emerged during the research process (Franzak, 2002). Participants expressed that while they are the teacher in their classroom, their approaches may differ given the needs of their students. This allowed them to be flexible in their teaching methods as they understood all students do not receive information the same way. Also, guiding students to learn and allowing them to share their approaches was connected to their pedagogical belief within their professional identity.

Critical Race Theory

Beyond the fact that that title of this study has *African Americans* in it, CRT informed both the research design and analysis in a way that I did not expect when I initially designed this study on African American teachers. Critical race theory recognizes that racism is embedded in laws, policies, and institutions that uphold and emphasize racial inequalities and inequities (Gay, 2002). Within the interview process, regardless of what dimension of themselves, participants described their race as foundational. As an African American male, it was important to me to make sure I did not shy away from the topic of race and that I provided a line of questioning that allowed participants to feel safe to disclose authentic responses.

As a collective, the participants believed their racial identity did influence their teaching identity. Participants emphasized the importance of making students, especially their African American students, aware of the systemic barriers they face in education. One of the focuses of CRT is recognizing and addressing the racial disparities that exist within educational systems. Recent efforts to ban racial justice discourse in public education are part of a long history of backlash in response to the demands for educational equity.

Ladson-Billings and Tate (1995) argued that CRT in education could provide a cohesive theory and tool set to examine the issues of educational inequality. The participants of the study discussed the value of their diverse teaching experiences which exposed them to different populations. Pertaining to diversity in teaching, CRT

emphasizes the importance of diversity and representation within educational institutions to provide a more inclusive and equitable learning environment.

Providing equitable learning environments directly correlates to the impact on African American students because if they are not given the same educational opportunities as their peers of other races how will they ever be ready to compete on a level playing field throughout life? Participants in the study noted that their impact on African American students could be more influential given the smaller population size and the challenges the African American students face. CRT highlights the disparities in educational outcomes for miscellaneous racial groups and the need to address these disparities through intentional efforts (Lynn, 2004).

Cultural awareness and teaching are topics that was ignited under the CRT framework in this study because the participants discussed how they considered the learning styles and preferences of their students, especially those students of color, when they were preparing instruction (Guinier, 2004). Ladson-Billings (1995) stated the major tenet underlying this perspective or paradigm was that children who were not White and middle class were somehow defective and lacking within education. The participants of this study acknowledged removing barriers and biases to ensure students can access quality education will call for addressing structural and racism and discrimination. This call to action will create the barriers for marginalized groups which directly aligns with an emphasis of CRT. Also removing biases will directly result in empowering students because the dismantling of racial biases in education and advocating for equitable

education will allow and empower all students the opportunity to tap into their intellect and brilliance.

Ecological System's Theory

Ecological Systems Theory developed by Bronfenbrenner (1983) emphasized the influence of various systems and contexts on an individual's development and behavior. In this study, Ecological Systems Theory was applied to understanding the impact of race on a STEM teacher's success. This theory was impactful in guiding the research and findings for the study because it underscored how worlds connect in ways one may not imagine or see at face value. In this study the responses from the participants reflected the impact of race within the educational environment, considering factors at different ecological levels.

Participants expressed that their cultural and home background influenced their ability to connect with students. This related to the microsystem which includes the immediate environments in which one interacts, like families and peer groups. The participants' cultural and racial backgrounds allowed them to relate to their students with similar cultural expectations and backgrounds which fostered a more favorable microsystem for those students. The teacher-student relationship is a direct reflection of the microsystem, and it was found in this research that race did indeed impact and influence their relationships with students.

In this study, the mesosystem represented the interaction between different microsystems, such as the school and home environment. The teachers' experiences and perspectives are influenced by the composition of the staff, affecting their feelings of

belonging and influence on students. Participants mentioned that they worked at different schools with varying proportions of other Black teachers. This interaction between the teacher's racial identity and the racial composition of the teaching staff is related to the mesosystem because it emphasized the importance of culture in building connections with those around them.

A repeated conversation that took place during the interviews with the participants was their need to feel they must prove themselves in predominantly non-Black school environments. The exosystem includes external influences that indirectly affect the individual. In this case societal attitudes and institutional policies would be those factors. Thus, the participants' experiences were shaped by the broader racial dynamics and expectations within their teaching environments. As the researcher I was intrigued by age gaps within the participants because it was the participants who had more years of experience who expressed the sentiment of having to prove themselves at one point or another to their peers in contrast to the newer teachers who believed the need to prove themselves to not only their peers but their students who subconsciously challenged their knowledge.

Comments and anecdotes that touched on cultural differences and language barriers relate to the macrosystem. The macrosystem represents broader cultural, societal, and institutional factors that influence one's development. These factors include language differences and how different cultures approach education. While the macrosystem encompasses the broader culture it also acknowledges social norms including stereotypes and expectations which can influence the teacher's role and success.

The chronosystem recognizes that individuals and their environments change over time and with the participants of this study the influence of this system was not any different. It is important to note that teachers' experiences and perspectives may evolve as they gain more teaching experience and encounter different students and other individuals within the school environment. The chronosystem is also responsible for major life events and transitions that influence individual growth and development.

Relation to Research Question

This study employed a qualitative research process to address the primary research question. The research question was generated from the literature regarding the tenants of race, identity, teacher identity and the STEM field. While these served as the anchor tenants for the research, various other themes emerged during the research process.

Research Question

Research question one asked, Does African American (racial identity) influence STEM teacher success in the middle school classroom context? The themes that emerged in the data were vital in concluding a response to the guiding research question. The themes that emerged were Identity v. Experience, Teaching v. Identity, Who I Am v. the Classroom Environment I Foster, Race v. Success, Race v. Teaching Identity, and Success as a Multidimensional Concept. To fully answer the research question there must be further explanation provided on the themes from the data.

Theme 1: Identity v. Experience

This theme was supported by the conceptual framework of Identity Theory (Freud, 1923). Within this theme participants spoke about the factors that they felt defined themselves. This included standard social categories, and this also included traits that could not be seen from the outside. Participants categorized themselves into various social groups, such as an educator, Black, and one similar trait was their familial role, whether a mother, father, or husband.

Their responses to the inquiry about their identity highlighted the importance of their social identity as educators which was a vital part of their self-concept. Self-concept is the goal seeking agent that compels one to act in a way to meet their desires and orients itself in a way that reflects the views of the universal other (Mead, 1934). There was also acknowledgment of their identity as a Black person indicating these social identities. Identity salience in this context addressed the varying descriptions of identity in different scenarios showing how different aspects of identity can become salient depending on the context.

Overall, the responses from the participants helped derive this theme and demonstrated how identity theory can be applied because individuals categorized and described themselves based on their social identities, how those identities changed in different contexts, and the experiences that led them to foster their identities.

Theme 2: Teaching v. Identity & Theme 3: Who I am v. The Classroom

Environment I Foster

These themes really distinguished the participants from one another. While they all shared the identity of African American or Black and STEM teachers, their identities as teachers varied tremendously while still rooted in similar foundations. Some of these foundations of their teaching identity included passion for their role, adopting student centered perspectives, and holistic approaches. Collectively the participants expressed a desire to be the teacher that students deserved, which reflected a commitment to caring about students' well-being and building productive learning environments.

Another common foundational trait amongst the participants teaching identity within this theme was their holistic approach to teaching. There was an innate focus on strengthening students' weaknesses and building their confidence. This was common as the participants noted how they wanted success for the students in multiple areas, not just academically.

As a Black male and student, I have always appreciated when educators are able to identify an area of improvement within me and work with me to better myself in that area. I have been in spaces working in the field of education that have required me to step outside of my role and offer compassion to students who did not seem to receive it from others. I understand the significance of addressing both academic and non-academic aspects of student growth and development. This comes into effect when having a student-centered approach.

Participants expressed their belief in students' abilities and the value they placed on diversity of thought. This helped to create environments where students were encouraged to investigate and pose questions ultimately expressing different viewpoints. This student center approach emphasized the importance of student agency within shaping identity as a teacher.

Theme 2 and Theme 3 are important to answering the guiding research question because it aligned with key aspects of Teacher Identity Theory. Responses from participants directly correlated with Teacher Identity Theory by illustrating how personal experiences, beliefs, adaptability, and a student-centered approach contributed to shaping their identity as a teacher. Teacher identity is not only informed by professional experience but also personal experience and a commitment to addressing issues and partialities within the education system.

Theme 4: Race v Success and Theme 5: Race v. Teaching Identity

Critical Race Theory is the framework that examines how race and racism intersect with various components of society, especially education. This theory was important to this study because it allowed participants the opportunity to fully embrace their race as it directly related to their profession. Working in spaces with others of different races can be handled in various ways but finding the intersection between one's race, their professional identity, and their perspectives of success through in depth interviews can bring about the emergence of several crucial themes and talking points.

Participants in the study were encouraged to be as honest as possible in their responses to the interview questions and when topics of challenging stereotypes and low

expectations were discussed during their interviews there was a clear standpoint that being a Black teacher was not the same other races that teach. It was also made clear that one's race does not come into effect until they are around other teachers that do not look like them.

Critical Race Theory examines how stereotypes and low expectations can negatively impact students of color and encourages educators to challenge these stereotypes and foster a sense of agency and possibility within students (Balaghi & Okoroji, 2023). This also dictates to how many of the students see African American teachers in front of them prompting the conversation on representation and diversity.

The findings from this study prove that participants believed that it was important to have teachers who represented the racial and ethnic diversity of the student body. The participants also spoke about their experience of being placed in their position due to their race for diversity reasons but succeeding through hard work. This finding aligns with discussions in CRT about affirmative action and the importance of diversifying fields like STEM. When asked if race played a role in their success as a STEM teacher, one participant responded,

It does, because when I was growing up, I didn't have that many African American teachers. I was in a very small town, mostly white. I had mostly white teachers, white principals, white males at that. And so, my success lies in showing for young ladies of color, whether they're Hispanic or black. Reminding them you can learn from people that look like you. (personal communication, September 29, 2023)

Simply put, representation and diversity are not strangers to the research conducted surrounding CRT especially as Critical Race Theory encourages the hiring and retention of diverse teachers to provide role models and support students who may not see themselves represented in the classroom (Bates & Glick, 2013).

Themes 4 and 5 also encompassed CRT by the participants' outlook on overcoming barriers and fostering student success. There was a verbalized commitment to helping students tap into their potential and overcome societal barriers and biases. Themes four and five highlighted various aspects of how race plays a role in the success of a STEM teacher. It also connected the experiences to Critical Race Theory examination of race and racism in education. Furthermore, it highlighted the complex ways race can influence one's experience as a STEM teacher and finds the intersection with the principles of CRT, which aims to identify and address racial disparities and society.

Theme 6: Success as Multidimensional Concept

To be successful in one's profession is one component, but to add the complexities of one's race in an underrepresented content area, the concept of success means so much more to an individual. Success is not one dimensional and this research proved that as participants described how they defined success as African American STEM teachers. This question was supported by the Ecological Systems Theory because the responses from the participants highlighted their role within the context of various systems within the framework.

Participants collectively spoke about success in terms of fostering and developing growth within their students. Simply put, if their students did not grow, they were not successful as a Black STEM teacher. Their success metrics were heavily influenced by the students they teach. From their impact on student's choices in higher education and careers to encouraging students to define their own success, the participants identified these outcomes as implications of their success. The growth of the students are part of the success metrics for teachers. These success metrics support the participants role within the microsystem as their role is to empower and inspire students to help them find their purpose and opportunities within the STEM field.

In terms of success, it was important that the teachers recognized what their district's success metric looked like because it allowed them to work with a goal in mind while still building themselves as educators. The participants acknowledged the district's focus on test scores but contrasted that focus by emphasizing the importance of holistic growth within students which included their ability to connect with the content and promote student's ability to think critically. The eight participants all had their own perspectives of success, but they all agreed that the student's growth is the leading indicator of success.

As it related to how participants defined success as an African American STEM teacher the connection to the macrosystem within the findings stood out because this system represents the broader cultural and societal context. Participants highlighted the significance of diversity in STEM education and how their role as African American teachers inspired students to pursue STEM related careers. The research findings indicate

that success is not one dimensional. The participants expressed various components that added to their success and how they defined success as a Black STEM teacher. I feel there is a mutual understanding that as Black teachers in general there is a need to genuinely make a positive impact on students. The issue of representation stretches far beyond the realm of education but being able to teach a content area where African Americans are disproportionately represented is a duty not for the weak.

From the collection of data in this study, while racial identity did influence STEM teacher success in the middle school classroom context and while race may be the primary social category that influenced teachers' success, their success was dependent upon their motivation to see students grow while promoting continuous learning and improvement. During this research process it was intriguing to see how other systems and social categories impacted the participant's perspective on success. I know from firsthand experience the pleasure educators get from knowing they have made an impact on a student or even their school community. It offers a sense of fulfillment both personally and professionally.

Recommendations for Practice

The findings of this study indicate that racial identity does influence teacher success but that is only in tandem with other social categories and systems. Based on the findings, the recommendations for practice are presented on the grounds of increasing representation of African American STEM teachers in the middle school context.

Recommendation #1 Improving and Advancing STEM Pathways.

Study participants noted that representation and visibility can help increase students' interest in pursuing STEM fields. Individual journeys from education to careers can be quite complex. The STEM pipeline model proposes a direct and linear progression from typical STEM education to STEM occupation. The STEM pipeline model is not reflective of the exhaustive range of career opportunities available to those with STEM related degrees or those who want to teach a STEM related field within education as the participants of the study.

A focus on pathways encourages a shift in the focus of inquiries concerning workforce competitiveness from how many degrees does one possess to what STEM knowledge and skills are required to be effective in a role. The participants of this study noted that their presence mattered to their students as they inherently took on the role of mentor and advisor. However, as educators they noted they cannot ignore their journey to get to their role because their students may have similar pathways to obtaining a STEM related role.

The National Academies of Sciences, Engineering, and Medicine (2019) recognized that if STEM pathways were not attractive as opposed to other career options, students would not find the interest in undertaking and persisting in STEM courses of study. Therefore, it is vital that the conditions of these pathways are assessed because even though times will have changed from the participants journeys to STEM teaching as opposed to their current students, they are still expected to have similar barriers given the commonalities of their race.

Recommendation #2 Create and implement more effective access and recruitment strategies.

In addressing diversity and inclusion within STEM, access and recruitment have proven to be two distinct but connected problems. Access is defined as a way of approaching or entering a place or pass to and from a place to approach or communicate with a person or thing. Recruitment refers to the process of identifying, interviewing, selecting, and onboarding employees.

Creating initiatives to increase Black STEM teachers in the K-12 context should focus on reducing barriers and supporting them within their personal and professional development. With this, it is important to recognize the role of human resources departments. The human resources department must identify and change recruitment and hiring efforts that are not inclusive. These departments can consider adjusting marketing materials, recruitment sources, candidate scoring metrics, and the overall interview and hiring process that can deter Blacks and other underrepresented groups. Human resources departments also need to address unconscious biases. Kennedy et al. (2019) offered the example, that rather than hiring people with disabilities because it fills a personal morality cup, it should be viewed as a component of a talent strategy that will behoove the organization and outweigh what can be viewed as potential expenses and risks.

Implementing diverse and effective access and recruitment strategies can help in addressing the issue of inequitable education access because the inequities are easily attributed to the fact that the teacher workforce is not reflective of the increasing racial and ethnic diversity of K-12 students in public education (Brown, 2012). Most research

on recruitment efforts indicate that having Black teachers in K-12 benefits students of all races as Black teachers have the potential to serve as a resource for the school and surrounding communities (Erby, 2023; Liu et al., 2017).

Recommendation #3 Implement and enforce measurable retention strategies based on objective standards

Retention is an imperative issue for maintaining diversity and inclusion within STEM and education. There are several factors that can impact retention which include but are not limited to hostile work climates that are misaligned with policies that support diversity and inclusion and poor efforts to support institutional commitment and accountability. Institutions and school districts can learn from practices and polices already in place that create mutually supportive environments that further a substantive sense of belonging to increase retention (Allen-Ramidal & Campbell, 2014).

School districts can implement confidential third party or internal climate assessments and use that to build the foundation for an equity office that promotes a safe space for employees. This implementation can also be effective in supporting the establishment of employee resource groups, and programs and initiatives that support a healthy career-life balance (Charvat, 2009; Turk-Bicakci & Berger, 2014). This will be vital in ensuring objective efforts to increase retention.

Implementation and enforcement of effective retention strategies will not be successful without an accountability factor. Incorporating and making it clear that inclusion is part of a school district's mission and core values can be used to coordinate strategic investments for inclusion efforts that can be measured through data (National

Research Council, 2013). With this data component, districts should track hiring actions separations to help emphasize trends in hiring and retention and find solutions based on specific demographic markers. I also believe there needs to be another level of accountability at all levels, especially the federal level that funds these school districts. Federal agencies should have a level of accountability which requires them to monitor the state and quality of STEM education and teacher hiring to insure efficacy. Ultimately, to fully comprehend the issues that impact retention, school districts should look at differences in hiring demographic especially for those underrepresented teachers in constantly emerging subject areas such as STEM.

Implications for Future Research

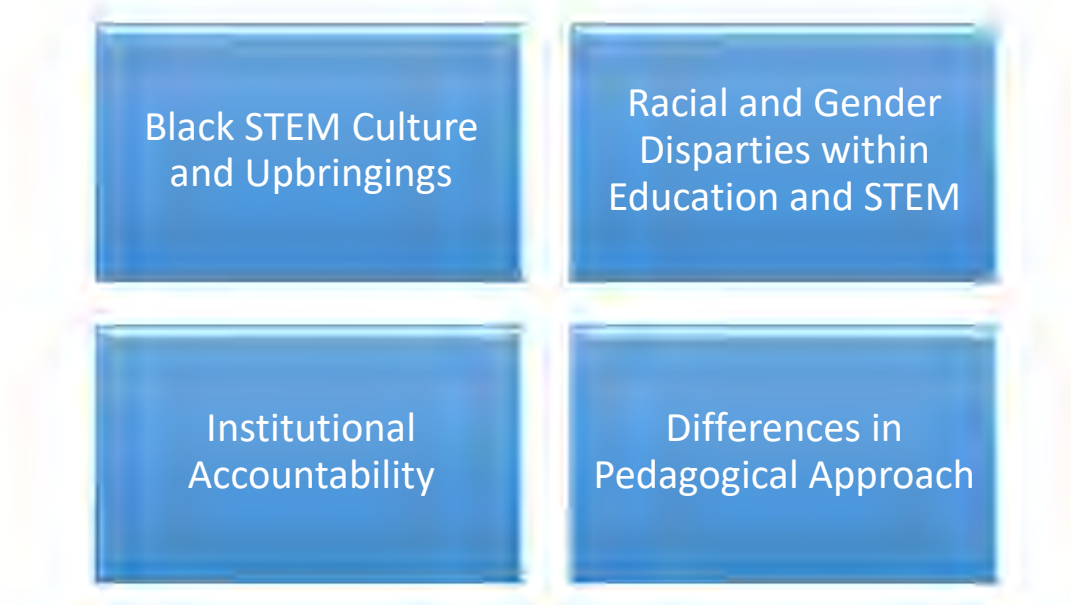
The findings from this study provide insight into the multiple systems and social categories that influence the success of African American middle STEM teachers. While this multisite case study provided insight into the personal and professional experiences of the participants, research that extends various other themes that emerged is necessary. First, researchers should investigate Black STEM teacher cultures and upbringings that influenced their decisions to teach. This can help understand how they shaped and developed their racial identity and identify the intersection point of their professional identity.

Secondly, research should focus on the gender disparities within Black STEM professionals and educators. Only 25% of my total participants were male. This is an implication for a much more imperative conversation on why Black men are not teaching

at the same rate as Black women and more specifically, why they are absent in STEM content areas.

Third, future studies should explore the issues of institutional accountability in ensuring that the teacher demographics of a campus are representative of the student body and community it serves. Lastly, I feel researchers need to complete more research on the differences in pedagogical approaches to instructional delivery in terms of race. Exploring how non-minority teachers deliver curriculum to minority students in inner city schools can advance the body of research on teaching strategies based on race and learning styles. The implications for future research are visualized in Figure 2.

Figure 2: Implications for Future Research



Summary and Conclusion

This multisite case study explored the experiences of eight exceptional and experienced African American and Black middle school STEM teachers. In utilizing a qualitative methodology, interviews were conducted, audio recorded and analyzed by the

researcher. Six themes emerged from content analysis: (a) *Teaching v. Identity*, (b) *Who I Am v. the Classroom Environment I Foster*, (c) *Race v. Success*, (d) *Race v. Teaching Identity*, (e) *Identity v. Experience*, (f) *Success as a Multidimensional Concept*. The conceptual framework was based on Critical Race Theory (Bell, 1980), Identity Theory (Freud, 1923), Teacher Identity Theory (Watson, 2006), and Ecological Systems Theory (Bronfenbrenner, 1983). Discussion was presented summarizing the relationship of the findings of this study to the conceptual framework and to the related literature.

This study provided a glimpse into the experiences of African American middle school teachers in an urban school district. Their responses to the questions asked in tandem with personal anecdotes presented a chronicle of their ability to obtain success within their professional context. The findings in this study serve as a basis for future inquiry into the areas of Black STEM culture, racial and gender disparities within STEM and education and the issue of institutional accountability. More importantly, this study created a framework for understanding the perils of being a Black teacher in an unrepresented content area.

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