2022

AN EXPLORATION OF A RESEARCHER-INSTRUCTOR PARTNERSHIP IN IMPLICIT RACIAL BIAS AWARENESS AND MITIGATION IN COLLEGE STEM CLASSROOMS

Jacqueline Johnson Wilson
Virginia Commonwealth University

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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April 2022

ACKNOWLEDGMENTS

To my committee chair:

Dr. Jeffery Wilson, thank you for all the check-ins, for nothing but positive and enthusiastic encouragement, and for gentle nudges toward the finish line. Thank you for encouraging me to make my voice heard.

To my committee members:

Dr. Lisa Webb, you were instrumental in this dissertation coming to fruition. Thank you for your kind support.

Dr. Lisa Abrams, thank you for your methodology expertise and the gentle suggestion to shorten my initially proposed study.

Dr. Risha Berry, thank you for giving me permission to say it loud and say it proud.

To my study participants:

If not for IRB confidentiality considerations, I would name each of you one by one. Thank you! Thank you! Thank you! and Thank you! This work would not have been possible without you taking a chance on this partnership model and trusting me.

To my support team:

Angela, Julie, and Pete, thank you for your support and friendship. Angela, my accountability partner, thank for Sundays at 3pm! Julie and Pete, let's brunch!

Last but never least:

To my parents, Robert and Rose Johnson, thank you for the foundation of unending love, opportunities, and support.

To my husband, Nolan, thank you for your patience!

To Aunts Vernessa and Cheryl, a special thank you for your help with the kids. You were the closest I will ever come to my wish of having a clone!

To the ancestors, especially Edith and Jestina, thank you for the sacrifices and investments. It is on your shoulders I stand.

DEDICATION

I dedicate this work to my children,

NiLadga, Naja, Niara, Jala, Noelani, and Justice.

To my girls:

Never stop running like a Girl,

Never stop dreaming like a Princess,

Never stop strategizing like a Queen!

To my baby boy, Justice:

You work so hard to be the best Justice you can be. You are my inspiration!

ONE LOVE!

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ABSTRACT

AN EXPLORATION OF A RESEARCHER-INSTRUCTOR PARTNERSHIP IN IMPLICIT RACIAL BIAS AWARENESS AND MITIGATION IN COLLEGE STEM CLASSROOMS

By Jacqueline J. Wilson, PhD

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

Virginia Commonwealth University, 2022

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Seventy-six percent of all minority students who enter college with declared majors in science, technology, engineering, and mathematics (STEM) do not graduate with STEM degrees. Black students represent 40% of minority attrition from STEM. Implicit racial bias was indicated as a contributor to the challenges faced by Black students. The purpose of this study was to explore whether a researcher-instructor partnership brought awareness to and the potential for mitigation of implicit racial bias in course delivery and instructor interactions with Black students in STEM classes. A case study design was used over three phases to gather survey, observational, and interview data. The survey was used to collect descriptive data, data on instructor knowledge of implicit racial bias, and to recruit instructors to Phase 2 of the study. Phase 2 data were gathered through classroom observations and weekly meetings with each instructor over a 6-week period. Phase 3 data were collected using a semistructured interview to gather instructors' perceptions of the study and benefits of the partnership. Surveys were completed by 19 STEM instructors. Four of the 19 instructors participated in the researcher-instructor partnership. Instructors reported

joining the study to learn more about implicit racial bias and ways to improve instruction. Instructors found the partnership offered a respectful and comfortable space to discuss implicit racial bias. The partnership was beneficial in bringing awareness to the impact of implicit racial bias and in improving instructor-student interaction.

Keywords: implicit racial bias, mitigation, Black students, STEM, attrition, partnership, case study

CHAPTER 1 – INTRODUCTION

Statement of the Problem

It was estimated that 2.4 million jobs in the fields of science, technology, engineering, and mathematics (STEM) went unfilled in 2018 (Smithsonian Science Education Center, n.d.). With a projection of 3.5 million STEM jobs needing to be filled by 2025, the gap in employment and unfilled jobs in the STEM fields is projected to remain static (Lazio & Ford, 2019) unless students are retained and matriculate in STEM fields. Data suggested although 40% of Black students and 20% of Latinos students transferred out of STEM majors, only 1.5% of White students did the same (Killpack & Melón, 2016). The discontinuation of STEM majors is often precipitated by course drops, failures, and withdrawals from barrier classes, which are defined as those requiring a passing grade to continue in a chosen STEM major. Research indicated Black students—not only those in barrier classes but also those who continue in their chosen STEM major—often feel isolated, report a lack of peer support, and feel invisible to their professors (Strayhorn et al., 2013).

The aforementioned primarily highlights the economic impact of lost human capital due to reduced rates of STEM matriculation among Black undergraduate students. Greenwood et al. (2020) demonstrated there is a detrimental loss of human life when Black students do not advance in STEM majors. In this study of 1.8 million births, 23 years of data revealed a White infant mortality rate of 289 deaths per 100,000 births, and Black infant mortality rate was nearly

triple that of White newborns, with Black infants dying at a rate of 784 per 100,000 births. The findings further showed, under the care of White physicians, White newborns die at a rate of 290 per 100,000 births, and Black newborns under the care of White physicians die at a rate of 894 per 100,000—more than 3 times the rate for White infants. Finally, when cared for by Black physicians, the rate of Black infant mortality was reduced by nearly 60%. Greenwood et al. (2020) advocated for the need "to continue the diversification of the medical workforce" (p. 6).

Considering the disparity in educational statistics, economic shortfalls, and health care delivery, there is a need to investigate obstacles to continuation in STEM majors by Black students to propose avenues to reduce attrition and increase the number of Black students retained in STEM majors. One such obstacle is the racial implicit bias Black students encounter in the classroom setting.

College Experiences of Black STEM Majors

As previously noted, Black students often feel isolated, report a lack of peer support, and have feelings of being invisible to their instructors[1] (Strayhorn et al., 2013). Black students feel isolated because there are few fellow Black students enrolled in STEM courses, thus limiting peer support. Studies have shown, when Black STEM students connect with other Black students, they engage more in research opportunities (Hurtado et al., 2008) and are more encouraged to persist in STEM (Borum & Walker, 2012; Gaston-Gayles & Kelly, 2004). The impact of a lack of peer support from other Black students is often exacerbated by expressions from White classmates, and often corroborated with silence from instructors, that placement in a STEM-based program was the result of affirmative action programs, thus suggesting Black students were provided "unearned access to the institution" (Hurtado et al. 2010, p. 10). The

[1] The term "instructors" is used generically throughout to represent instructors, associate professors, assistant professors, and professors.

attrition of Black students from STEM majors due to feelings of isolation because of the absence of Black peers and instructors may lead to the student's questioning of belonging. Along with the questioning of belonging is often a feeling that White students and White instructors ignore Black students because they have low expectations of their academic performance (Cabrera & Corces-Zimmerman, 2017; Gasman & Nguyen, 2019; Strayhorn et al., 2013).

Peterson et al. (2016) noted White instructors tend to have higher expectations for White and Asian students than minority students who happen to be Black or Latino. Potential deficits in willingness and ability to engage Black students informs the need for instructors to be mindful of the effects of disparities in interactions with Black students and the importance of attempting to engage isolated Black students to ensure the exchange of valuable information (Rubies-Davies, 2015). Milkman et al. (2014) highlighted challenges to instructor engagement with students. In a study consisting of 6,548 instructors, identical letters of inquiry from potential graduate students were sent to instructors to express interest in learning more about instructors' research and the possibility of joining their research team. The only difference in the letters was the name of the candidate. Each letter contained names that indicated gender and ethnicity. The researchers found letters from students with traditionally White male names were more likely to receive a response from the professor. This study is just one example of how bias may impact Black students' ability to access valuable research opportunities successfully.

Like Hurtado et al. (2010), Estrada et al. (2016) highlighted additional factors impacting Black student longevity in STEM majors. The researchers contended although Black students enter the STEM fields at the same rate as White students, institutional deficiencies contribute to Black attrition. To improve retention, they suggested institutions track progress toward achieving a diversified STEM contingency. As Hurtado et al. offered, Estrada et al. also suggested

universities should recognize challenges faced by economically under-resourced students and should offer financial resources to those students. The National Center for Educational Statistics (NCES; Hussar et al., 2020) reported Black students are 45% more likely to attend high poverty K–12 schools (defined as 75% or more students receiving free or reduced lunch) compared to their White counterparts. Although economically under-resourced Black families often connect their children with community-based programs to supplement STEM instruction (King et al., 2021), research has shown family economic disadvantages contribute to Black students leaving STEM majors (Estrada et al., 2016; Riegle-Crumb et al., 2019; Zhang, 2021). Furthermore, by universities forging strategic partnerships with organizations, faculty, and mentors to create extracurricular opportunities for Black students to engage in research experiences and form peer support groups, the retention rates of these students may increase (Xu, 2016).

Although there are discussions of negative impacts to student retention in STEM majors due to perceived instances of racial bias, it is also important to discuss the impact to emotional and psychological well-being of Black students. As a result of racial bias evidenced through expressions that Black students do not belong or have not earned their way into STEM programs (McGee, 2016), Black students often experience anger and anxiety followed by overwork to validate their place in the program (Oseguera et al., 2020). Stress associated with racial bias experienced by Black students has been shown to impact academic persistence and graduation rates negatively (Cabrera et al., 2017).

Implications of Implicit Bias

Though several obstacles to Black student success in STEM majors have been discussed—isolation, lack of peer support, feelings of invisibility, low expectations from

instructors, and economic disadvantages—it is necessary to explore another likely obstacle contributing to reduced numbers of Black students graduating with STEM degrees: implicit bias.

The term *implicit bias* is used to describe actions taken that are guided by the unconscious. The unconscious is comprised of one's upbringing, socialization, and other life experiences (Banaji & Greenwald, 1995). Implicit bias is defined as the mental process that manifests an individual's negative feelings and attitudes about people based on characteristics like race, ethnicity, age, and appearance. As the Kirwan Institute for the Study of Race and Ethnicity (2012) stated, "Implicit biases are pervasive" (p. 1) in society. Implicit racial bias is implicated in the field of education as a contributing factor to the causes of disproportionality in school discipline (Gregory, et al., 2010) and achievement (McGrady & Reynolds, 2013). Because this cognitive process functions in the unconscious mind, individuals typically are not consciously aware of the negative biases, racial or otherwise, that develop over time and are fueled by internalized and generally stereotypical ideations one holds about individuals or groups of people (Banaji & Greenwald, 2013). Implicit bias is evidenced by one's lived experiences, socializations, and interactions, which all help to inform thinking about and interactions with individuals. Stereotypical ideations can impact instructors' perceptions and expectations of students, particularly Black students (Osta & Vasquez, 2019). Because implicit bias is produced from the unconscious and is activated instantaneously, leaving no time for thoughtful consideration of one's actions before they occur (Kahneman, 2011), it is necessary for instructors to recognize potential biases that may influence their instructional delivery without their explicit awareness. Additionally, implicit bias encountered in the classroom setting likely contributes to feelings of isolation and invisibility.

Based on data collected in the fall of 2017, the NCES (2019) reported White instructors,[2] associate professors, assistant professors, and professors comprised 77% of full-time university faculty. The category of professor notably was represented by 81% White faculty. Thus, college instructors remain largely composed of White instructors who bring to their institutions and classrooms a privilege that creates gaps between themselves and their Black students (Killpack & Melón, 2016). The gaps may become spaces for implicit bias to operate. However, implicit bias can be perpetrated by any individual of any racial or cultural background (Gilliam et al., 2016). When there is no access to professional antibias training (Staat, 2015), and when colleges and universities provide workshops in isolation without connections to individual, societal, and institutional contexts (Pittman, 2021), instructors, if they chose to engage in implicit bias mitigation, are often left to evaluate their own actions through mindful reflection on processes that originate in the unconscious and whose manifestations are not evident to the individual perpetrating implicit bias (Staats, 2015).

Peterson et al. (2016) stated, "Both explicit and implicit stereotypes and prejudiced attitudes develop from repeated exposure to pairings of a social group . . . with a particular characteristic" (p. 124). For college instructors, such instances of repeated pairing may occur with the commonly held notion that Black students did not earn their entrance to the university but were simply given seats in demanding STEM classrooms (Hurtado et al., 2010). Although explicit biases are easier to control, implicit biases are activated automatically in fast-paced, unanticipated, and often stressful moments that do not allow time for contemplation (Kahneman, 2016; Peterson et al., 2016).

[2] The use of the term instructor here represents the actual category of college instructor.

Further research concluded teachers no more possess nor promote egalitarian views than other adults in society (Starck et al., 2020). In fact, teachers are instrumental in "perpetrating racial inequality" (Starck et al., 2020, p. 281). Based on the analysis of 1.6 million responses to the Black-White Implicit Association Test (B-W IAT), 68,930 preK-12 teachers were identified, and results of respondents' B-W IAT scores showed a significant level of racial implicit bias among teachers. The American National Election Study (ANES) 2008 Time Series Study, which offers a nationally representative sample, was used to compare results of teacher B-W IAT scores. The ANES used the Affective Misattribution Procedure to measure racial implicit bias (Payne et al., 2005). When results of the teacher B-W IAT were compared to results of the ANES, the results remained consistent. Teachers who participated in the study were found to have similar levels of racial bias as individuals in other professions (Starck et al., 2020). The authors concluded because "implicit racial bias has been relatively slow to change at a societal level, reducing racial bias in a way that is efficient and resistant to broad social influences is a challenging goal" (p. 282).

Historical Roots of Marginalization

The focus of this historical overview was to conduct an appraisal of existing research to offer an understanding of how implicit bias becomes rooted in the psyche of Americans and to give a physiological-psychological overview of the mechanism of implicit bias according to the literature. Although the following historical overview of prejudice and racism in society does not focus specifically on the impact of implicit bias in the educational setting, it attempts to illustrate the pervasive nature of racial bias and potential impact to individuals in a society where racist ideology and images have been prevalent in many aspects of daily living. One may choose to engage in prejudice or racism; however, implicit bias is not engaged in by choice. Repeated

exposure to racist and stereotypical images in daily life makes implicit bias more likely to occur in any individual, including educators.

The Establishment of Implicit Bias

The historical roots of a group of people being marginalized simply because of their differences run deep. Renowned sociologist W. E. B. DuBois (1940) noted:

> The individual may act consciously and rationally and be responsible for what he does; but on the other hand, many of his actions, and indeed, as we are coming to believe, most of his actions, are not rational and many of them arise from subconscious urges. It is our duty to assess praise and blame for the rational and conscious acts of men, but to regard the vast area of the subconscious and the irrational and especially of habit and conviction which also produce significant action, as an area where we must apply other remedies and judgements if we would get justice and right to prevail in the world. Above all we must survey these vague and uncharted lands and measure their limit. (p. 171)

Long before the work of Banaji and Greenwald (1995), Devine (1989), and others on implicit bias, DuBois (1940) recognized the subconscious basis of actions based on race. The issue of implicit racial bias is nuanced and has historical roots. What is now defined as prejudice and racism, as well as unacceptable attitudes and behaviors toward Black citizens of the United States, was once generally accepted behavior by a large portion of society (Lennig, 2004). As demonstrated in studies designed to examine bias, individuals often reject the notion that they are subject to implicit bias because they abhor prejudice and racism. After completing an instrument designed to measure bias, individuals are often in disbelief when the measure's results return an indication of bias. Often these individuals do not understand how they were deemed to be biased by a particular measure when they disagree with prejudiced and racialized actions. This sense of

disbelief in some instances turns to anger directed at the test, and results are then touted as incorrect (Clark & Zygmunt, 2014; Schroeder et al., 2013). Consequently, here lies the frequently misunderstood essence of implicit bias—it is an unconscious process. The following section provides an overview of U.S. racial history to illustrate the pathway of negative images and stereotypes into the psyche of individuals, thus creating space for implicit bias to manifest.

An overview of history (see Figure 1) sheds light on how individuals unwittingly fall susceptible to implicit racial bias. Although implicit bias can occur in numerous areas, such as gender bias, elder bias, body image bias, and a plethora more, the focus of this study was on implicit racial bias, which has been inculpated in police shootings of Black individuals like Amadou Diallo (Gladwell, 2005), the fatal shooting of Trayvon Martin (Feingold & Lorang, 2012), disparate school discipline of Black children (Gregory et al., 2010), the achievement gap (McGrady & Reynolds, 2013), and the ousting and arrest of two Black male entrepreneurs from a Philadelphia Starbucks café waiting for a meeting (Hauser, 2018). These examples are just a few. These examples are recent history; however, a distance history offers explanatory power of how implicit bias becomes established. The following historical overview documents the pervasive racial prejudice that has permeated society.

18th and 19th Century Philosophers

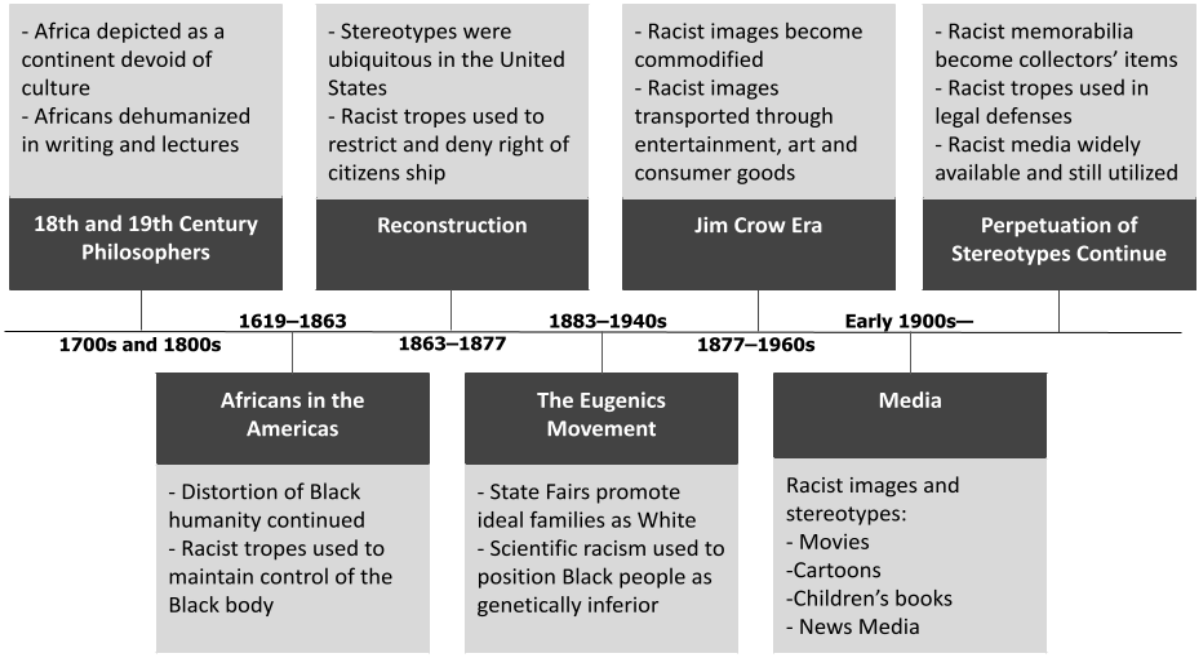
Renowned philosophers of history, via university lectures and speaking engagements, were culpable in transporting negative images of Africans[3] throughout Europe. According to Pieterse (1992), the works of 18th and 19th century philosophers like Hegel, Kant, Engels, and

[3] The use of the words Africa or Africans is decidedly a connotation that serves to negate the vastness and diversity of people groups and cultures that contributed to the history and development of the continent. The terms Africa and Africans are used in this discourse in reflection of a generally adopted view and understanding of the era.

Marx, among others, created false and self-serving narratives of the inhabitants of Africa. For example, Hegel's book, *Philosophy of History,* a compilation of lectures given at universities and throughout Europe, purported the African as "wild and untamed" (Hegel, 1830, as cited in Pieterse, 1992, p. 34), followed by the advice, "If you want to treat and understand him rightly, you must abstract all elements of respect and morality and sensitivity—there is nothing remotely humanized in the Negro's character" (p. 34). Swedish botanist Linneaus described Africans as "lazy," "sly," "sluggish," and "neglectful" while conversely describing Europeans as "light," "wise," and "inventor" (Charmantier, 2020). Long, a reported authority on the enslaved African, purported the African and European were of differing species and furthered the argument by likening female children of the African to the offspring of animals suggesting that, like animals, African females reached maturity much sooner than European females (Pieterse, 1992; Seth, 2014).

Figure 1

Timeline of Historical Marginalization



This pattern of treatment of the African continued in numerous forms of discourse, even from those who had never encountered an African. In his dissertation at the University of Gottingen in 1775, Blumenbach, later touted as the premier racial theorist, wrote of African people through descriptive, grotesque caricatures. Upon seeing drawings of actual Africans, he was stunned at the departure from the stereotypical caricature of the time. Unlike many other philosophers, Blumenbach went to Africa to study and began reporting stereotypes of Africans permeating European society were incorrect (Pieterse, 1992). Previous work by philosophers such as the German-educated Ghanaian, Amo (1703–1751), detailing not only the accomplishments of science, art, philosophy, and law in Africa but also of its accomplished thinkers (Abraham, 2004) went unrecognized. Amo's work, like that of Blumenbach, did not impact the widely accepted as fact narrative that Africa was a continent devoid of culture, history, or beings suitable to considered equal to the European (Adegbindin, 2015; Camara, 2005; Diop, 1987; Pieterse, 1992).

Africans in the Americas

The aforementioned views on Africa helped to justify the enslavement of Africans. Throughout the enslavement of Africans in the United States, the distortion of their humanity continued. The African male was described as brutish with super-human strength and a propensity toward violence; therefore, all means were taken to subdue him and protect White society (Kendi, 2016). These images were presented to control the movement of enslaved Africans and thus protect the financial investment of the "owner."

After the 1863 Emancipation Proclamation, during Reconstruction, and into the era of Jim Crow laws, stereotypes of Black people were ubiquitous in the United States and permeated every aspect of society. The period of Reconstruction saw renewed and robust attempts to use

scientific racism to deny the rights of citizenship to liberated African Americans (Gates, 2019). Stereotypic images of Black people were used in product advertisements, artwork, on dishes and common household items, and in children and adult games (see Figure 2). Product advertisements for everyday items such as laundry detergent and shoe polish portrayed Black individuals in animalistic, inhuman, and otherwise demoralizing positions. In Figure 2, beginning at the top left, a Black man is depicted in monkey caricature taking instructions from a White horse, indicating even an animal is smarter than and positioned in dominion over the Black worker. The two pictures on the top row to the right are representative of the dehumanization of Black humanity. The second row offers an image of Black babies with the caption "Alligator Bait." Although these images were transported via artwork and postcards, they are representative of the actual inhumane practice of hunters using Black babies to attract alligators (Hughes, 2017). In the bottom row, household products such as cleaners and dishes often depicted Black people with grotesque and exaggerated features, and as dirty and in need of cleaning. The final picture in the bottom row uses imagery of a lynching on a Valentine's Day card, again communicating the dehumanization and expendability of the Black body. These products, common in households across the country, put in the face of common citizens negative, dehumanizing images of Black people daily. Later, notably after the passage of the 1964 Civil Rights Act, many of these items became sought after collectables (Pilgrim, 2015).

Figure 2

Proliferation of Stereotypic Images

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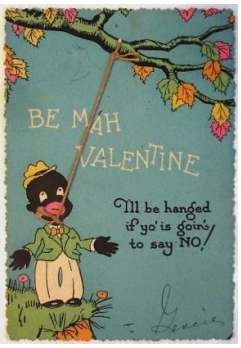


The Eugenics Movement

The eugenics movement of the late 19th and early 20th century was begun by Charles Darwin's cousin, Francis Galton. The medical definition of eugenics is "a pseudoscience with the stated aim of improving the genetic constitution of the human species by selective breeding" (Shiel, 2018, p. 1). Though eugenics was "manifested as the promotion of selective breeding, it

ultimately contributed to the intellectual underpinnings of state-sponsored discrimination, forced sterilization, and genocide" (Farber, 2008, p. 243). From this movement, individuals, usually poor and/or Black, were sterilized so they would not produce "inferior" offspring. Building on the work of notable doctors of the time, like Samuel Cartwright and U.S. founding fathers like Thomas Jefferson, who deemed Africans to be inferior in intellect and similar in behavior and adaptations to animals, eugenics became so popular that it was being taught in universities across the country (Kendi, 2016). The eugenics movement was so prevalent in the United States that eugenics offices were located on the grounds of state fairs where families were awarded prizes in the Better Babies and Fitter Families contests (Seldon, 2005).

Media

Media in the form of movies, children's books, and television news broadcasts help to transport to millions the concept of Black inferiority. The most renowned film of the Jim Crow era was *The Birth of a Nation*. The film transported images portraying Black men as violent, brutish rapists, imbeciles, and Black senators as fried chicken eating drunkards. Reviewers of the time reported "the film is certain to be well advertised over the country, as it will arouse discussion of the negro problem both south and north" (Lennig, 2004, p. 2). Media outlets reported there was "no cause for racial objection" (Lennig, 2004, p. 11). The Ku-Klux Klan was applauded and "the conflict of the Ku-Klux and the Negroes whom they fought to subdue was only the usual movie conflict between the powers of good and evil" (Lennig, 2004, p. 11). The movie and reactions brought into play the normalization of racial intolerance and violence.

Media such as children's books have been responsible for transmitting negative images for generations. Popular books such as Dr. Seuss's, *If I Ran the Zoo,* and Frances Hodgson Burnett's, *The Secret Garden,* contain racial slurs and stereotypic images. Additionally, popular

cartoons depicting racist themes and characterizations were produced by major corporations and studios, namely Walt Disney Corporation, Warner Brothers, and Metro, Goldwyn, Mayer. Cartoons of the early to mid-1900s, including Bugs Bunny and Tom and Jerry, portrayed Black people with animal-like features, as unintelligent and as buffoons (Jim Crow Museum, 2022)

News media have been responsible for transmitting images that, contrary to data, represent Black families as poor, the Black father as irresponsible and absent (Dixon, 2017), and Black people as overwhelmingly associated with criminal activity (Dixon & Linz, 2000). Studies have shown these misrepresentations influence negative perceptions of Black people and fuel implicit racial bias (Dixon, 2008; Gorham, 2006).

Racial stereotypes transmitted through media have proliferated not just the psyche of Americans but also people groups and communities around the globe. Via cable networks, newspapers, magazines, and online sources of information, rural residents of Taiwan have been shown to hold views of Black Americans as "self-destructive, dirty, lazy, unintelligent, criminal, violent, or ugly—all features of the age old White racial frame" (Feagin, 2020, p. 189).

Present Day Critical Incidents

Research on critical incidents developed by Flanagan (1954) defined critical incidents as "observable human activity that is sufficiently complete in itself to permit inferences and predictions . . . in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects" (p. 1). The following critical incidents have been selected to demonstrate a societal past littered with racist actions and ideologies that still fuel individual thoughts and behaviors in the present time.

In recent history, historic tropes have been used of the Black man possessing brutish superhuman strength and the invoking of animalistic descriptions in the legal defense of White men who killed unarmed Black men. In the 2021 trial of three White men who cornered and murdered Ahmaud Arbery while he jogged down a residential street, defense attorney, Laura Hogue, resorted to the tactic of dehumanizing Arbrey when she described him as jogging down the street "in his khaki shorts with no socks to cover his long, dirty toenails" (Waldrop, 2021, para. 1). In the killing of 18-year-old Michael Brown by Ferguson, Missouri police officer Darren Wilson, who stood 6'4" and weighed 210 pounds, testified to a grand jury that he felt "like a five-year-old holding onto Hulk Hogan" when he and the 18-year-old engaged in a struggle that preceded the deadly shooting (*State of Missouri v. Darren Wilson*, 2014).

A colleague shared with me that his first recollections of being aware of race was when, at age 7, his grandmother told him he was not allowed to marry a Black or Jewish person. Notably, this conversation was not lost to the recesses of his memory but very prominently remembered as his first encounter with the concept of race. Further discussion was not had to determine the impact of this conversation on my colleague's thoughts and interactions with Black and Jewish people. It is reasonable to conclude similar conversations, or critical incidents, have taken place in innumerable households across the country as notions and beliefs are passed down from generation to generation by one of the most effective venues for transmitting ideas, the family (Bigler & Patterson, 2017).

In the 1990s, at a gas station in Georgia, above the cash register, hung a picture of a fat White butcher holding a large cleaver raised above his head as he chased after several piccaninnies (a derogatory term for and caricature of Black children). The caption read,

“CONTROL YOUR CHILDREN OR WE WILL.” I left the gas station in stunned disbelief at the dehumanization and suggested murder of Black children.

Psychology and Physiology of Implicit Bias

Human beings possess both implicit and explicit attitudes regarding issues of racial bias. Noted previously, implicit racial biases are entrenched through repeated exposure to negative stimuli. Neurological connections to implicit bias have been researched. Specifically, the amygdala, a structure in the brain, consists of two structures made up of several nuclei and is in the temporal lobe in both cerebral hemispheres. Originally thought to facilitate quick responses to fear-inducing stimuli, additional functions have been studied. In addition to fear response, the amygdala plays a role in the processing of stimuli leading to emotional and psychological responses (Jones et al., 2014). Further research demonstrated “the importance of the amygdala as an implicit information processor and its role in unconscious memory” (LeDoux, 2007, p. 874).

Stanley et al. (2008) highlighted several studies on neurological connections to implicit bias. Phelps et al. (2000) used functional magnetic resonance imaging (fMRI) to monitor blood flow to the amygdala during a study of White participants who were shown pictures taken from a college yearbook. Pictures consisted of Black and White male faces unfamiliar to participants. A week after the fMRI was completed, participants were tasked with completing the Implicit Association Test (IAT; Greenwald et al., 1998), which “measures the degree to which social groups . . . are automatically associated with positive and negative evaluations” (Phelps et al., 2000, p. 730) and engaged in eyeblink startle response measurements relating to viewing the same set of Black and White faces. The eyeblink startle response was used as “another measure of indirect racial bias” (Phelps et al., 2000, p. 730). The eyeblink startle response, used in the “emotional evaluation of stimuli . . . is enhanced or potentiated in the presence of negative

stimuli" (Phelps et al., 2000, p. 730). Results showed amygdala activity differed when the race of the face in the pictured differed from the participant's own race. Activity of the amygdala "correlated with negative indirect responses to Black compared to White faces" (Phelps et al., 2000, p. 731) on the IAT and the eyeblink startle response measurements. Supporting the findings of Phelps et al., Cunningham et al. (2004) found, when presented Black and White faces to White participants, either subliminally or supraliminally, blood flow to the amygdala increased when Black versus White faces were presented subliminally. Contrastingly, when the pictures were presented supraliminally, or consciously, the automatic amygdala response was suppressed, suggesting another regulatory process dictated conscious evaluations when given time to consciously evaluate the pictures. The response of the amygdala to the subliminal Black images indicates automaticity of amygdala engagement. Further investigation showed other areas of the brain, the dorsolateral prefrontal cortex and the anterior cingulate cortex, reduced the amygdala's automatic response (Cunningham et al, 2004; Jones et al., 2014). Stanley et al. (2008) suggested these studies offered significant evidence of the amygdala's role in automatic responses and evidence of other brain structures used in the regulation of automatic, implicit attitudes.

In consensus, psychologists and neuroscientists have divided the brain and the components responsible for implicit or automatic responses and explicit responses into two categories: System 1 and System 2 (Jones et al., 2016; Khaneman, 2011). Though responsible for millisecond automatic responses, System 1 is considered the slow learning, fast thinking (Khaneman, 2011) system that "records information slowly and is sensitive to repeated patterns, events, and activities" (Jones et al., 2014, p. 187). Responding "automatically without intention or effort" (Jones et al., 2014, p. 195), System 1 responds based on learning over the span of an

individual's lifetime. System 1 treats this learning, which includes negative racial stereotypes, "as representations of reality" (Khaneman, 2011, p. 51). Khaneman (2011) emphasized System 1 "automatically and effortlessly identifies causal connections between events, sometimes even when the connection is spurious" (p. 110).

In contrast to System 1, System 2 is considered a fast learning, slow thinking (Khaneman, 2011) system individuals use to learn new concepts such as a math problem, a new language, or any skill requiring concentrated effort to learn in a relatively quick manner versus over a lifetime (Jones et al., 2014). Khaneman (2011) described System 2 as representing an individual's "conscious, reasoning self that has beliefs, makes choices, and decides what to think about and what to do" (p. 21). Though distinctly different systems, each system can exercise influence over the other. System 2 is often influenced by the interpretations of System 1 through "impressions, intuitions, and feelings. If endorsed by System 2, impressions and intuitions turn into beliefs, and impulses turn into voluntary actions" (Khaneman, 2011, p. 24). System 2 also acts as a check on the impulsive behavior of System 1 (Khaneman, 2011), which may be important in mitigating implicit bias.

Though Systems 1 and 2 have different functions, System 1 will respond when System 2 is busy with cognitive functions. During times of cognitive engagement or overload, individuals are more likely to "make superficial judgements in social situations" (Khaneman, 2011, p. 41) and be subject to "implicit attitudes play[ing] a larger role in guiding our behavior" (Jones et al., 2014, p. 195). In the case of educators who often manage busy and intellectually challenging environments, there are many opportunities for System 1 to respond based on implicit biases (Peterson et al., 2016).

In an analysis of automatic and controlled cognition regarding levels of racial prejudice and stereotype activation, Devine (1989) found, regardless of the level of racial prejudice demonstrated by study participants, all were impacted by automatic stereotype activation. According to Devine (1989), "Automatic processes involve the unintentional or spontaneous activation of some well-learned set of associations or responses that have been developed through repeated activation in memory" (p. 6). Automatic processes are "inescapable," and controlled processes are intentional and flexible, which "makes them particularly useful for decision making, problem solving and the initiation of new behaviors" (Devine, 1989, p. 6). Controlled cognition is used for evaluation and decision making; however, studies have shown automatic stereotypes are more accessible than controlled decision making (Devine, 1989). Studies have suggested, when children are exposed to stereotypes at a young age, the stereotypes have a much longer time to be etched into memory through reactivation (Bigler & Liben, 1993). Before children develop the cognitive structures needed to evaluate the validity of stereotypes and establish their own personal beliefs about issues of racism and prejudice, stereotypes have etched cognitive pathways with repeated activation reinforcing these cognitive pathways (Bigler & Liben, 1993; Bigler & Patterson, 2017; Doyle & Aboud, 1995). Baron and Banaji's (2006) study showed White 6-year-olds, 10-year-olds, and adults possessed the same level of implicit biases toward Blacks. The same study also demonstrated, at age 6, children demonstrated the highest level of explicit racial biases with significant decreases in children at age 10, and adults exhibited the lowest number of explicit biases among the three groups (Baron & Banaji, 2006; Jones et al., 2014). Demonstrated here is the process by which cognitive beliefs misalign with automatic activation of stereotypes.

Implicit Bias in K–12 Education

The following section highlights studies demonstrating the influence of implicit bias in K–12 educational settings. As more is learned about implicit bias, long-standing disparities in education are being examined through a different lens.

Implicit Racial Bias and the "Achievement Gap"

The achievement gap is a phrase used to describe the disparity in standardized test scores of Black and Latino/a students compared to White students, with White students generally outscoring Black and Latino/a students. Further investigation of the phenomenon uncovered, not the inability of Black and Latino/a students to achieve but rather a lack of equal opportunity in access to resources required to demonstrate equitable achievement (Ladson-Billings, 2006). Lack of resources, combined with the historicity of racism, prejudice, and injustice in education, have resulted in Black students bearing the burden of the negative impact of centuries of misattributed deficits such as lack of intelligence as touted in the debunked eugenics movement. Ladson-Billings (2006) challenged the concept of the achievement gap, which is the gap between test scores of Black and White students, by countering that the "achievement gap" is an opportunity gap. Although families, community-based resources, and activists have filled the gap by investing in and supplying extracurricular learning opportunities, many Black students have been denied equal access to quality educational resources historically and systematically, including teachers who limit academic attainment by having lower expectations and offering less challenging work and opportunities to Black children. As evidenced in the following study, teachers' implicit attitudes toward students were linked to lower achievement.

van den Bergh et al. (2010) conducted what is believed to be the first study to connect implicit prejudice attitudes to lower achievement for minority students. The study of 41

elementary school teachers and 434 students was conducted in the Netherlands. The Modern Racism Scale (McConahay, 1986) was administered to teachers to measure explicit prejudiced attitudes. The IAT (Greenwald et al., 1998) was administered to measure teachers' implicit prejudice attitudes. In addition, teachers were asked to respond to a scaled measure assessing their academic expectations for individual students. Standardized test scores in math and text comprehension were obtained as measures of academic achievement. Results of a multilevel model, which controlled for gender and socioeconomic status, showed teachers with negative implicit prejudiced attitudes were more inclined to rate their minority students as "less intelligent and having less promising prospects for their school careers" (van den Bergh et al., 2010, 518). Although the implicit measures showed a significant interaction between prejudice attitudes and lower achievement for minority students, measures of explicit bias did not correlate to achievement. As Jones et al. (2014) noted, implicit biases can be masked using appropriate and socially acceptable language, which likely include scaled responses on measures such as the Modern Racism Scale. Thus, implicit attitudes are more predictive of disparate treatment (Jones et al., 2014). Supported by Dovidio et al.'s (2002) work, van den Bergh et al. (2010) suggested "prejudice attitudes of teachers may be communicated nonverbally to their students, and ethnic minority students may respond accordingly with reduced motivation to achieve" (p. 520). Reduced motivation to achieve may be precipitated by fewer opportunities to engage in high-quality learning tasks, reduced eye contact and kindness from the teacher, and abbreviated interactions from and with the teacher (Brophy & Good, 1970; Peterson et al., 2016; Rubie-Davies, 2015).

Implicit Racial Bias and Disparate Discipline

In the Commonwealth of Virginia, a 4-year-old was taken from school, in handcuffs, and driven to the sheriff's office for throwing blocks and kicking at a teacher (Ferris, 2015). Virginia has led the nation in what has been termed the school-to-prison pipeline (Ciolfi, 2015). Specifically, Virginia ranked number one in the country in the 2011–2012 school year, with 17,863 students, which was 3 times the national rate (Ferris, 2015), referred to law enforcement, and no laws existing to protect students from these unnecessary and sometimes violent arrests (Legal Aid Justice Center, 2015). Also, in Virginia, Black students represent "23% of the student population, but were subjected to 58% of short-term suspensions, 60% of long-term suspensions, and 55% of expulsions. They were 3.6 times more likely than White students to be suspended" (Langberg & Ciolfi, 2016, p. 1).

According to Achilles et al. (2006), Black students are "disproportionately suspended, expelled, detained, and incarcerated" (p. 217). Data were collected from Maryland state reports detailing suspension and expulsion rates for the period of 1995–2003. Data were analyzed with SPSS using a predictive regression model. An odds ratio of being suspended was calculated with White students being the reference group. Findings revealed an increase in the odds ratio of suspension for Black students beginning at 1.6 in 1995 and increasing to 2.5 by 2003. Achilles et al. (2006) indicated a zero-tolerance policy had led to harsh methods of suspension and expulsion to manage behavior. Schools adopted zero-tolerance policies from the federal government's no-nonsense approach to the war on drugs. The authors indicated rules for the application of zero-tolerance policies indicate they are to be administered equally across the board and thus are unable to account for the reasons for disproportionate Black suspension rates but propose "racial and cultural differences between teachers and staff result in unequal

treatment of minority students" (Achilles et al., 2006, p. 223). This study was limited in its ability to gather gender- and school-specific data, as data were collected from the Maryland State Department of Education, which only offered a statewide compilation based on race.

Demonstrating that the issue of disparate discipline is not limited by geography, Lewis et al. (2010) researched the impact of discipline patterns at a high school in the Midwestern United States. Data were collected for the 2005–2006 academic year to study disciplinary actions administered by race and gender. The researchers looked at 10 punishable offenses and 10 sanctions for those behaviors. The researchers then calculated a relative risk ratio by comparing the risk index of Black males to the risk index of White males. Lewis et al. calculated a relative risk ratio of 2.03 for Black males, indicating an overrepresentation of disciplinary action to this group. Their research also indicated White males often received less punitive punishments, such as restrictions at recess compared to suspension for the Black male, for the same offense. Lewis et al. subsequently concluded the number of days lost also correlates to lower proficiency ratings on standardized tests. Though it seems logical that multiple missed days from school, due to suspension, would indicate lower test scores, Lewis et al. did not look at the individual scores of the students suspended. The performance of all Black students was used to support the premise that suspension led to lower rates of proficiency without considering other possible factors.

Wallace et al. (2008) conducted a study with a sample of 10th-grade students from 420 high schools across the continental United States. A selection of students from each of the 420 schools completed a questionnaire by answering questions detailing how often they were sent to the office and how often they were suspended or expelled. Also examined were the influences of zero-tolerance policies and race and ethnicity (Wallace et al, 2008). Wallace et al., like Lewis et al. (2010), suggested the expansion of zero-tolerance policies from the control and reduction of

gun violence, drug use, and related violence to include instances of perceived defiance and disrespect, and what used to be the minor infraction of tardiness, have contributed to higher rates of suspension among Black students. Wallace et al. found, using the zero-tolerance policy, reported incidents of gun possession, drug violations, and violence were slightly higher among Blacks. The slightly higher levels, compared to other ethnicities, did not account for the disparity in rates of discipline for Black students. Wallace et al. also accounted for socioeconomic factors such as parent education, family structure, and proximity to urban locations and found these factors did not influence rates of school discipline. The primary factor in increased instances of school discipline was minority status (Wallace et al., 2008). Wallace et al.'s data suggested language and cultural differences may account for the trend in higher rates of discipline to Black students. In support of this conclusion, one author of the study shared an incident where a White male teacher was late to class. He met one of his students in the doorway who, upon seeing the teacher said, "Man, I was just fixin' to bounce on you" (Wallace et al., 2008, p. 11). The teacher took the student's statement to imply a threat of bodily harm instead of the culturally understood meaning that the student was simply about to leave. The teacher, based on his misunderstanding, referred the student to be suspended. Wallace et al.'s study was limited by use of student self-reporting, which risks over or under reporting incidents. Although the study did not include any measure for bias or discrimination on the part of teachers and administration, another studied showed Black students are more likely to be disciplined for subjective offenses than Whites students (Skiba, 2014).

Although Wallace et al. (2010) did not account for educator bias, McGrady and Reynolds (2013) did examine educator bias by studying the concept of racial mismatch. According to McGrady and Reynolds, racial mismatch suggests there is a cultural gap between teachers and

students. Nine thousand students of English teachers and 9,500 students of math teachers comprised the sample of students who completed a survey. Tenth-grade math and English teachers from schools where sophomores were represented answered questions on how they perceived students. This study was limited to survey data. There were 12 measures of perception, which included, but were not limited to, behavior, ability, respect for self and others, citizenship, and pride in work. Regression analysis was used with White teachers and White students making up the reference group. The study was conducted to determine if non-White students would fare better being taught by more non-White educators and more educators of the same race. The study found Black students on average received lower ratings than White students, across perceptual measures, from White teachers. The study also found perceptions of non-White teachers remained consistent between White and Black students. White teachers often excused the misbehaviors of White students by citing external factors such as "just a bad day," or difficulty in the home, whereas causes of behavioral problems for Black students were attributed to internal factors such as lack of motivation and lack of self-control. The trend held true for not only perceptual measures but also performance and grades (McGrady & Reynolds, 2013).

In contrast to the aforementioned cases, Monroe and Obidah (2004) conducted a qualitative study of a Black teacher and her interactions with her students of the same race in an eighth-grade class consisting of 12 Black boys, nine Black girls, and one White girl. The observation, aimed at studying the dynamics of a culturally synchronized classroom, was conducted in a public school in a large metropolitan city. The study consisted of 45 hours of classroom observation and 2½ hours of interviews with the teacher, who had 10 years of teaching experience. Monroe and Obidah found humor and exhibiting local colloquialisms are an integral part of classroom interaction, thus bridging the gap between home and school cultures.

The teacher understood and worked around bad grammar and colloquial banter that could be viewed as disruptive behavior by someone not familiar with inner city Black culture. According to Monroe and Obidah, this form of cultural responsiveness serves to build solidarity between teacher and student while reducing negative outcomes for students, which may include suspension. The educator, who was the focus of this study, demonstrated full control and no fear of exerting control, therefore reducing the need for strong-armed, zero-tolerance policies such as suspension and expulsion employed by nonsynchronized educators (Monroe & Obidah, 2004). Unfortunately, this valuable study was based on one classroom in one urban setting, which limited the extent to which the findings applied to other contexts. The findings, however, are consistent with research on the positive impact culturally responsive instructional approaches can have on student outcomes and can help to ameliorate the negative impacts of implicit bias.

In a qualitative analysis of various studies on the disparate application of discipline in school, Gregory et al. (2010) supported the aforementioned findings but also took the time to dispel commonly held notions. Through qualitative analysis of research, Gregory et al. demonstrated children from disadvantaged socioeconomic backgrounds are not more likely to misbehave in school; thus, this assumption did not account for high rates of school discipline in these areas. Similarly, low academic performance, which sometimes leads to dissatisfaction and aggressive behavior, was not a predictor of justified school discipline, as minority students with good grades still are represented disproportionately in school discipline. Because much of the data previously collected relied on self-report, whether Black students over or underrepresented their involvement with school discipline was examined along with White students' self-reports and compared with teacher reports in discipline measures. Both Black and White students accurately self-reported. Gregory et al. (2010) suggested the overrepresentations of Black

students in school discipline may be a result of "cultural mismatch, implicit bias, or negative expectations" (p. 63) by educators. The authors suggested more mixed method studies are needed to clearly identify the contributing factors to the disproportionate representation of Black students in school discipline, and, from these studies, prevention programs should be developed.

The research studies reviewed here indicated there was disparate administration of school discipline to minority students. Often socioeconomic status was identified as a reason Black students exhibited behaviors worthy of suspension. The studies reviewed here that accounted for socioeconomic status dispelled this as the underlying reason for increased suspensions. Instead, the conclusion of most studies indicated teacher bias and cultural mismatch as influential in school discipline practices (Westerberg, 2016). Though teacher bias and cultural mismatch were noted as separate indications of disparate discipline, I propose, based on the historical overview presented earlier, that cultural mismatch contributes to teacher implicit bias.

Statement of Purpose and Methodology

The goal of this research was to explore whether a researcher–instructor partnership brings awareness and the potential for mitigation of the impact of racial implicit bias in course delivery and instructor interaction with Black students in STEM classes. Consequently, achieved may be the mitigation of the unintended negative impact of instructional practices that may be influenced by implicit bias, on Black college student failures, withdrawals, and drops in barrier and subsequent STEM classes, thus improving the retention and matriculation of Black students in STEM majors. A study of this nature will not only provide information to assist universities' advancement toward fulfilling diversity, equity, and inclusion objectives but will also produce more graduates prepared to fill gaping vacancies in 21st century STEM employment.

The theory of change guiding this project proposes the impact of implicit bias in the classroom setting can be mitigated by creating a researcher–instructor collaborative. According to Feagin (2020), "It typically takes many hours of instruction and dialogue over many months to get . . . adults to even begin to think deeply and critically about the array of racially stereotyped images, beliefs, emotions, and interpretations" (p. 246) that influence individual behavior. Additionally, Feagin (2020) asserted "changing . . . centuries-old framing will require much effort and innovation, and major new educational strategies" (p. 246). Because implicit bias is a process beginning in and manifesting because of unconscious processes, influenced by a lifetime of learning in which individuals often are not aware of their own expressions of bias (Staats, 2015), using a researcher to observe classroom interactions, in class and online course content and materials, visual media presentations, and instructor execution of course objectives, the instructor can be observed for the manifestation of bias. The researcher developed a partnership with a STEM instructor to aid the instructor in becoming aware of potential implicit biases. The partnership was developed, beginning with the voluntary enrollment of instructors into the study. Once enrolled, the researcher scheduled an initial meeting to discuss the program protocols and begin relationship building with the instructor. Each weekly meeting served to build the partnership by developing open communication and an atmosphere of trust, which is key to developing a space in which sensitive topics such as implicit racial bias can be discussed openly and freely. This innovative approach to eliminating unintended biases during course instruction serves to create equitable environments for Black students by no longer leaving the instructor to single-handedly identify unconscious processes.

The hypothesis of this study asserted partnerships with instructors designed to expose unintentional or implicit bias will assist instructors in becoming aware of potential unconscious

biases, thus offering the opportunity to view course delivery practices through a new lens. Ultimately, unbiased course delivery will minimize feelings of isolation and invisibility often expressed by Black students, foster a sense of Black student connectedness to the classroom environment, improve Black student STEM efficacy, and reduce Black student STEM attrition rates. Subsequently achieved are university initiatives to promote diversity and inclusivity in the sciences while increasing the number of STEM professionals prepared to fill over 2 million unfilled STEM positions.

The research questions guiding this study were:

1. What factors contribute to instructor participation in a researcher-instructor partnership to explore implicit racial bias in course delivery and instructor-student interactions?
2. How does researcher feedback impact instructor-student interactions and course delivery?
3. What are instructors' perceptions of the researcher-instructor partnership?

Conceptual Framework

The concept map (see Figure 3) displays some factors influencing interactions of students and educators in the classroom. The shapes and spaces of the map hold significance. Shown in blue boxes outlined by solid black lines are factors influencing the home environment and thus the student and educator. The box shape represents the fixed, rigid, or not easily changed entity of the family and its influence. Influenced by the family dynamic, the student and educators enter the learning environment. Individuals bring all their experiences to a social space called school. In this gray, irregularly shaped space, student, educator, and a myriad of conceptions interact and influence this social space. This space is gray and irregular because it has not yet been

demonstrated that mastery of incorporating different influences into cohesive and inclusive communities has been achieved. The gray boxes within the social space represent, fixed, rigid, and not easily changed attitudes and preconceptions brought to the space by individuals. Often, educators and students each bring to bear on the social space limited exposure to a diversity of cultural backgrounds, which leads to cultural incongruity, stereotyping, and mistrust. One significant difference the students do not share with the educator is power, which is exercised by the educator upon the students. Notably, implicit bias sits on the arrow from educator to power. This representation indicates implicit bias, combined with power exercised by the educator, may lead to imbalances in instruction and interaction. Because this bias has been termed implicit, its influence on the educator, for now, has not been distinctly related with the use of arrows. It currently holds a space that is influential but also requires further definition. The four-way arrows represent the influences of society (the white space that fills the background) on the family, students, educators, and the social space of the school. Societal influences, though not an inclusive list, includes political climate, economic policy, teacher training programs, and messaging. Student and educator shapes are round, indicating pliability because human beings are capable of intellectual, social, and emotional growth, which is needed to influence positive change in any situation.

Theoretical Framework

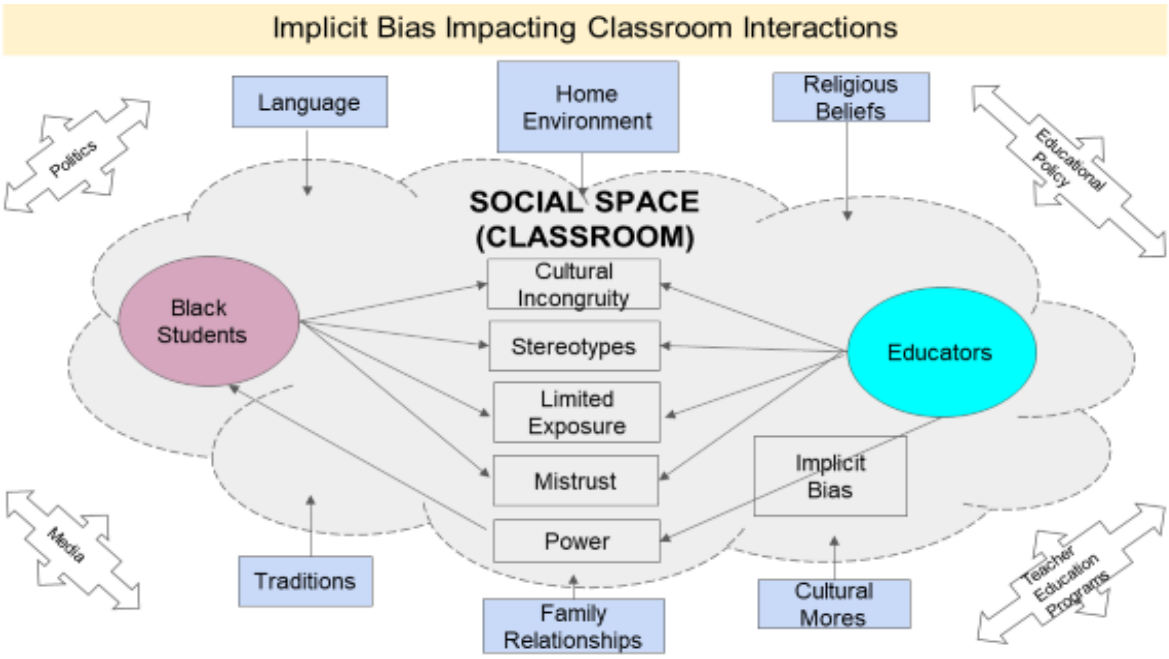
Symbolic Interactionism

The work of Blumer (1969) is a fundamental resource for understanding human interaction. Continuing the work of Mead (1934), Blumer, a student of Mead, developed the theory of symbolic interactionism, which is based on three founding premises. First, “human beings act on things on the basis of the meanings that the things have for them” (Blumer, 1969,

p. 2). “Things,” also referred to as objects in symbolic interactionism, are inclusive of everything in a human being’s environment including other human beings. The second premise asserts “meaning is derived from or arises out of the social interaction that one has with one’s fellows” (Blumer, 1969, p. 2). Influences from family, friends, and acquaintances are key in defining and reinforcing meaning ascribed to other human beings. The final premise posits the derived “meanings are handled in an, and modified through, an interpretive process used by the person in dealing with the things he encounters” (Blumer, 1969, p. 2).

Figure 3

Conceptual Framework



Note. Figure illustrates societal and cultural influences that are brought into the classroom.

It is essential to understand the meanings individuals assign to objects, which include persons, before assessing outward behaviors. According to Blumer (1969), “To bypass the meaning in favor of factors alleged to produce the behavior is seen as a grievous neglect of the

role of meaning in the formation of behavior" (p. 3). The meaning assigned to an individual, group of people, or anything in one's environment is developed fundamentally through "the process of interaction between people" (Blumer, 1969, p. 4). Therefore, the derivation of meaning is a social process leading to symbolic interactionism based on meanings learned in social interactions with familiar individuals in one's native environment. Through continued social interactions, meanings go through an iterative process and are used "for the guidance and formation of action" (Blumer, 1969, p. 5).

Human society consists of individuals engaging in actions with one another; however, underlying these actions are psychological processes or "schemes such [as] motives, attitudes, [and] hidden complexes" (Blumer, 1969, p. 7). Social interactions become the venue for psychological processes, such as implicit bias, to manifest in human behavior.

Cultural Historical Activity Theory

Although symbolic interactionism elucidates individuals' interactions in social settings, cultural historical activity theory examines individuals as a collective within activity systems and how those systems encounter and undergo changes. Activity theory was first developed by Russian psychologist Vygotsky and has been expanded upon by other theorists. I focus on the iteration of activity theory conceptualized by Engeström (2001) who emphasized five principles of activity theory.

The first of Engeström's (2001) principles states "a collective artifact-mediated and object- oriented activity system . . . is taken as the prime unit of analysis" (p. 136). This study defined the activity system as a classroom within a university system. The second principle emphasizes "an activity system is always a community of multiple points of view, traditions, and interests . . . [where] the participants carry their own diverse histories and the activity system

itself carries multiple layers and strands of history engraved in its artifacts, rules, and conventions" (Engeström, 2001, p. 136). The concept is representative of any school community. Represented within the university are diverse backgrounds and educational practices. The classroom teacher is a member of the larger activity system of the school. The third principle of historicity asserts "activity systems take shape and get transformed over lengthy periods of time" (Engeström, 2001, p. 136). The history of the activity—in this case, the activity of a university—was designed historically to educate wealthy White men. According to activity theory, the system (i.e., the university) must be studied to understand its "problems and potentials" (Engeström, 2001, p. 136). The fourth principle emphasizes the use of "contradictions [which] are historically accumulating structural tensions within and between activity systems" (Engeström, 2001, p. 137). Contradictions generally occur when the system "adopts a new element" (Engeström, 2001, p. 137) that intersects "old elements" (p. 137). Though the new activity may encounter resistance, it also presents an opportunity for innovation. The fifth and final principle provides that activity systems can be transformed and "as the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms" (Engeström, 2001, p. 137). The intention of this study was to encourage instructors and activity systems to deviate from the norm. Instructors should engage in, and activity systems should require, racial implicit bias awareness and mitigation training.

CHAPTER 2 – LITERATURE REVIEW

Disparities Extend to Postsecondary Education

The preceding chapter presented an overview of the impact of implicit bias in the PK–12 setting in terms of achievement and discipline disparities. Although the setting and context of education shifts at the postsecondary level, the following chapter explores the impact of implicit bias at the university level; assessment and mitigation efforts; and resistance to implicit bias awareness, education, and mitigation. This chapter concludes by highlighting the need for intentional and systematic strategies to reduce the impact of implicit bias in postsecondary education.

In a literature review of the analysis of campus ecology, Cabrera et al. (2016) offered descriptions of campus climate and culture in a critical examination of Whiteness on college campuses. The researchers examined inclusion, safety, and nonverbal messaging experienced by Black students on campus. To examine implicit bias, microaggressions are deemed to be "largely unconscious" (Cabrera et al., 2016, p. 127). Microaggressions are defined as "the brief and common place daily verbal, behavioral, and environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial, gender, sexual orientation, and religious slights and insults to the target person or group" (Sue, 2010, p. 5). Cabrera et al. (2016) contended "students of color are constantly the targets of linguistic racial violence in the college environment which not only depresses academic achievement but can

also adversely affect health" (p. 127). Supporting the continuation of hostile campus environments, Mill's (1997) concept of the epistemology of ignorance is applied to explain the behavior of White individuals in responding as though they do not recognize racism. In their perception, racism is an enigma. This, however, shifts when challenging spaces and programs designed for minorities. While denying systemic racism, the cry of reverse racism is often expressed. In addition, ontological expansiveness (Sullivan, 2006) is cited as another method used to deny space to minority students. White students expand into spaces designated as safe spaces for minority students to engage and feel supported; however, this type of cultural appropriation is not afforded to all students. An example of this type of appropriation and resistance is evidenced in the use of the *Fightin' Reds* as a school mascot. Another group of students was upset by this and decided to make their mascot the *Fighting Whites* in satirical opposition. The position of school officials was that the *Fightin' Reds* mascot was not offensive, but the *Fighting White* mascot was insulting. Exemplified in this example are concepts of microaggression, ontological expansion, and epistemological ignorance (Cabrera et al., 2016).

Cabrera et al. (2017) further discussed the relation of race and space as one that remains a challenge for Black students. Key access to professors, not just physically by attending office hours but by way of a conscious commitment to the success of Black students by equal opportunity and access to research projects, is often not extended. It is not likely that professors would indicate verbally purposeful exclusion of Black students from access to opportunity. Opportunity, however, represents and is opened by being accepted in a space as equally qualified to have access and to contribute unapologetically to the conversation from a different worldview without ostracization or exclusion (Cabrera et al., 2017). The idea of race and space reaches back to the K–12 setting in that spaces containing majority minority students are often under-

resourced and lack access to advanced, well-equipped STEM laboratories and opportunities to engage in experiential learning (Ladson-Billings, 2006). In the postsecondary education setting, Black students often are excluded from opportunity (Hurtado et al., 2010).

In a study of six postsecondary institutions, McGee (2016) documented the experiences of 61 high-achieving minority students in STEM discipline majors. Thirty-eight students identified as Black. Interviews were conducted to explore students' experiences with administrators, teachers, and peers. Students overall reported feelings of anxiety and anger, experienced imposter syndrome, and developed compulsive work habits to overcome lack of opportunities and deficit mindsets of fellow students and instructors. Students also reported experiencing racial battle fatigue as they managed stereotyping and microaggressions. These experiences place many of these students under added stress. Black students reported not being called on because they were assumed to not know the answer to complex problems. Most often, instructors called on Asian students to respond. A Black male nuclear engineering student reported that no matter how many As he earned, instructors always responded with surprise, and he was at times accused of cheating. One student reported feeling pressure to change her clothing and hairstyle. Though academically gifted, she felt instructors ignored and purposely avoided her. Compelled to change her hair and dress to avoid stigmatization, she reported a professor told her she then looked presentable and commented she must also be earning better grades. McGee reported students who succeeded in the program, even high-performing students, were forced to develop strategies to deal with negative stereotypes and microaggressions. This research indicated certain stressors are placed on Black students that White students do not experience. Stressors lead not only to anxiety and anger but also to questioning of belonging (McGee, 2016) and may negatively impact student outcomes (e.g., graduation, academic standing).

Assessing Implicit Bias

Implicit bias is an outward response to psychological processes taking place in the unconscious mind (Staats, 2015). Implicit bias is influenced by one's lived experiences, socialization, and interactions, which all help to inform how one thinks about and interacts with others. An individual's implicit bias usually results in favor being shown to those who belong to the group with which the individual identifies and shares commonalities such as race and culture. Being aware of implicit bias is especially important for teachers, many of whom interact with a more culturally diverse school population that does not always look like them (Clark & Zygmunt, 2014).

Often, the onus of remedying bias is placed on educators' ability to exercise self-awareness of an unconscious action (Clark & Zygmunt, 2014; Fiarman, 2016; Staats, 2015; Westerberg, 2016). It is believed the development of collaborative and trusting educational environments allow for continuous training to encourage self-awareness and colleague interventions to remediate possible biased behavior (Fiarman, 2016). The proposition to be explored is whether more objective methods of awareness and recognition are employed more effectively for exposure and mitigation of implicit biases.

According to Schroeder et al. (2013), online training modules offer efficient, cost-effective, and nonintrusive methods to assess attitudes toward multiculturalism and diversity. The researchers conducted a mixed methods study of 30 educators to study changes in attitudes after receiving multicultural training. Participants included 29 females with an average age of 49.9 and an average of 23 years of experience. Of the 29 female participants, 90% identified as White. The Munroe Multicultural Attitude Scale Questionnaire (MASQUE) and a 6-question short-answer survey were used to gather information on teachers' individual knowledge of

cultural diversity. Each instrument was administered twice, once before educators completed the online training modules and once after the modules were completed. The MASQUE consists of 18 items to measure multicultural orientations as self-reported by participants, and the six short-answer questionnaire measured participants' specific knowledge of multicultural concepts such as prejudice versus racism as well as broader concepts such as the effects of poverty and powerlessness. After the initial questionnaires were completed, participants completed an online multicultural training consisting of nine training modules on various topics pertaining to cultural awareness, language and cultural isolation, errors of judgment, and testing. Once the modules were completed, participants again completed the MASQUE and the six short-answer questionnaires. A matched-pairs *t* test was used to compare before training and after training responses. The *t* test indicated an increase in knowledge on both the MASQUE and short-answer questionnaire. Although demonstrating potential to educate and increase multicultural knowledge using online training, the study was limited in the capability to predict or measure whether an increase in knowledge would lead to changes in attitudes and behaviors (Schroeder et al., 2013).

Another tool available to teachers for assessing racial attitude is the Race Implicit Association Test (Race IAT; Greenwald et al., 1998). The test, a computer-based assessment, measures participants' preference for White people or Black people. By offering a visual image of a Black face or White face and a series of words representing various attributes such as "sweet," "rotten," "sincere," "hatred," and the like, researchers correlate word choices with the faces being viewed on the screen. The test requires a rapidity in viewing the facial images and making word selections to access the unconscious where implicit bias is believed to originate (Banaji & Greenwald, 2013). In addition to measuring a White or Black preference, combined with other studies, the Race IAT was also shown to predict prejudice behavior. Participants who

indicated a high White preference were also observed to show discriminatory behavior in interactions with Black individuals. These discriminatory actions were demonstrated in hiring practices with White applicants receiving more favorable assessments when compared with equally qualified Black applicants. Emergency room care also revealed discriminatory practice by "recommending the optimal treatment—thrombolytic (blood clot dissolving) therapy—less often for a Black patient than for a White patient who presented with the same acute cardiac symptoms" (Banaji & Greenwald, 2013, p. 49).

Using the Race IAT, Clark and Zygmunt (2014) suggested more intervention is required, as many teachers who completed the test did not accept the results fully. In their study, 302 early childhood and elementary teachers were administered the Race IAT and the Skin Tone IAT, which measures preference of light or dark skin. Of the 302 teachers, 293 were female, and of those, 278 identified as White. Included were eight identifying as Black, two as Hispanic, and five as mixed race. Ninety-six percent of participants' results indicated a White preference and a light-skinned preference. Participants' responses to the test were placed in 1 of 5 categories: disregard, disbelief, acceptance, discomfort, and distress. Thirty-three percent of participants disregarded the results, believing the test did not measure what it was intended to measure. Twenty-six percent expressed disbelief, suggesting the results did not represent their beliefs. Twenty-two percent expressed acceptance and acknowledged they have little experience with people of color and therefore the results made sense, although some felt the results were not related to bias. Nine percent expressed discomfort but accepted the results with great reflection. Ten percent indicated feelings of distress at how their bias may affect classroom practice (Clark & Zygmunt, 2014). With only 19% of participants engaging in reflection of self and practice,

there is a demonstrated need for more directly focused professional development to help teachers identify and reduce bias.

Toward Implicit Bias Mitigation

Research and practice such as those mentioned previously have shown individuals can become more self-aware and thus begin to replace stereotypical thinking. Irvine (2003) offered the theory of cultural synchronization. Irvine, a professor of urban education at Emory University, combines the methods of quantitative research, ethnography, and action research to train educators in the practice of cultural synchronization. Cultural synchronization theory suggests PK–12 educators can close the gap between home and school cultures of their students. To do so, teachers need to become versed in the cultural mores of the students they teach. This would include, but not be limited to, understanding variations in dialect and culturally accepted practices and interactions. Irvine offers a researched-based cultural immersion training program designed to help teachers maneuver successfully in the multicultural classroom. The teacher should not be the policeman of the classroom but instead a figure who is aware of the culture of students and works to weave their experiences into a classroom model that encourages connectivity and a respectful learning environment (Irvine, 2003).

Multicultural scholar Gay (2002) encouraged teacher training programs to better educate future leaders of the classroom. To reduce the effects of teacher bias, Gay suggested five areas of focus in professional training on cultural diversity. First, teachers must develop knowledge about elements of cultural diversity, which include "cultural values, traditions, communication, learning styles, contributions, and relational patterns" (Gay, 2002, p. 107). Second, Gay indicated the importance of designing a culturally relevant curriculum that encompasses cultural symbols and symbolism. The third element requires teachers to develop cultural caring and

create positive learning environments. One key component involves cultural scaffolding, which is achieved by using knowledge of students' culture and experiences to build learning opportunities. This method also aids in improving academic performance. The fourth element of training addresses issues of culturally responsive communication. Educators must become aware of the diversity in communication styles, which include cultural codes and discourse styles. Once these elements are explored, the educator can begin to weave these into the fifth element, which is cultural congruity in classroom instruction. In theory, the teacher is now equipped to maneuver fluidly through the delivery of instruction as a member of the classroom working together with students versus being a disconnected outsider (Gay, 2002).

In 2012, Devine et al. developed a "prejudice habit-breaking intervention" to help individuals become aware of implicit bias and reduce its impact. Those who acknowledge they have demonstrated bias, and who are willing to take steps to dislodge deep-seated bias resulting from their culture of socialization, are the best candidates for this process, which encourages participants to identify instances of bias and replace old images with new ones. Research, using the Implicit Association Test, indicates improvement over a 12-week period when reconditioning strategies are implemented (Devine et al., 2012).

In continued work on prejudice habit breaking, Cox and Devine (2019) suggested an empowerment-based strategy that treats implicit bias as a habit to be broken. The central theme of this approach is awareness and "conscious self-regulation" (Cox & Devine, 2019, p. 254). Based on the dissonance between explicit beliefs, which tend to be expressed in egalitarian terms, and implicit bias, Cox and Devine suggested five components to reduce implicit biases. The components require individuals embrace "sincere personal values that oppose bias" (Cox & Devine, 2019, p. 254), become aware they are vulnerable to implicit bias, become aware of the

impact on implicit bias, engage in mitigation strategies, and maintain a continued effort to reduce implicit bias. The researchers contended the habit-breaking "approach engages motivation and minimizes defensiveness by conceptualizing bias as a habit of mind arising from socialization and learning experiences" (Cox & Devine, 2019, p. 256). Thus, by channeling "egalitarian personal values" (Cox & Devine, 2019, p. 257) and highlighting "vulnerability to unintentional bias" (p. 257), the authors contended individuals will be motivated to align their "automatic responses . . . with their intentions" (p. 257). The prejudice habit-breaking intervention, through computer presentations and in-person seminars, offers strategies to participants such as stereotype replacement, increasing intergroup contact, and interacting in more diverse environments. In randomized controlled studies, participants in the intervention model reported increased awareness of implicit bias, discrimination as a problem, and increased effort to reduce bias within themselves. These effects were observed as early as 6 months and lasted up to 2 years. The major limitation of the study was that the results were based solely on self-reports.

Staats (2015), of the Kirwan Institute for the Study of Race and Ethnicity, much like Gay, suggested biases can be replaced consciously. Based on research, one suggestion offered to reduce implicit bias was to interact with those outside of one's own identity group. Additionally, one should seek "exposure to counter-stereotypical exemplars: individuals who contradict widely held stereotypes" (Staats, 2015, p. 32). Teachers can accomplish this by consciously selecting specific posters to put on classroom walls. In theory, this will help to replace stereotypical images. This suggestion seems very simplistic but may be offered as a strategy in conjunction with more formal training.

Aligned with the concept that educators should be engaged in cultural training programs as the U.S. public school population becomes increasingly multicultural, with a large portion of

those students being Black, especially in urban districts, Ladson-Billings (2009) developed culturally relevant pedagogy, which is teaching that "empowers students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes" (p. 20). Ladson-Billings (2009) conducted a 3-year study of teachers considered effective educators of Black students. Of the teachers studied, there was an understanding that race is not equivalent to culture, and these teachers embraced the rich cultural backgrounds of their students. Often teachers claim colorblindness and indicate they do not see color. Unfortunately, these attitudes highlight color and race and ignore culture. To teach Black children effectively, teachers must understand children of color have distinct and rich cultures and are not culturally disadvantaged children who need to be taught the dominant culture to be assimilated into "American" culture. Ladson-Billings also highlighted that the effective teacher could link contributions of Africans and Blacks to various periods in history. In one observation, she noted, before a math lesson, the teacher, an Italian American, took time to engage children in a brief history lesson before their algebra lesson. Shared with the children was the African origin of algebra, which was found in the work of Ahmes, dating back to 1700 BC. Students remained engaged as they developed and solved problems as a class (Ladson-Billings, 2009). A very specific training is required of teachers for them to execute a culturally relevant pedagogy because many of the contributions of cultures other than the dominant culture of the United States have been largely excluded from textbooks. Such training appears to be lacking in teacher training programs and professional development trainings.

Although not focused on the mitigation of implicit racial bias, a notable study was the "Toward Culturally Responsive Classrooms" project conducted by Bryn Mawr College (Cook-Sather & Des-Ogugua, 2019), a small liberal arts women's college enrolling approximately

1,380 students in its undergraduate program ("Bryn Mawr College," n.d.). The goal of the study was to create more inclusive and responsive teaching practices among faculty. Focus groups with students at the college were conducted with "students of color, other underrepresented students, and allies" (Cook-Sather & Des-Ogugua, 2019, p. 597). Whiteness, racism, and culture were themes that emerged from the focus groups and exemplified the experiences of minoritized students. Whiteness was expressed as "habit (or a habitat) and as an occupation of space" (Cook-Sather & Des-Ogugua, 2019, p. 595) that "perpetuate a system of privileges, domination, and exclusion" (p. 595) while also being perpetuated as "morally neutral, normative, and average and also ideal" (p. 595). The authors believed this ideology of Whiteness contributes to institutionally racialized learning environments that delegitimize the cultures of minoritized students, thus leaving them constantly negotiating between their home culture and the culture of the institution. Students in the focus group described the negotiation of cultures as a cause of "internal strife."

The pilot study led to the Students as Learners and Teachers (SaLT) program, which consisted of five paid students who identified as African American, Latina, and Ghanaian. They partnered with faculty members to observe and collaborate with faculty to help facilitate more "inclusive and responsive approaches to classroom practice" (Cook-Sather & Des-Ogugua, 2019, p. 597). Faculty members reported the SaLT program was beneficial in helping them to understand areas needing improvement and highlighting areas being executed well.

Seattle (Washington) Public Schools (2018) instituted racial equity teams comprising a team of school staff and parents to address "decades of deeply embedded bias" (p. 1) and "undo institutionalized and structural racism" (p. 1). The goal of the teams was to eliminate rates of racial disproportionality in discipline and graduation, transform school policies by examining

implicit bias, and encouraging stakeholder—students, families, and the community—participation in policy and practice initiatives. District staff and the Seattle Education Association provided training for the teams to create action plans, plan professional development, and offer staff coaching. With a mission defined by "learning, partnership, and shared leadership" (Seattle Public Schools, 2018, p. 1), Seattle Public Schools reported rates of graduation increased for minoritized students, and discipline rates declined. The district also reported significant academic growth for African American students in Grades 4 through 8. Quantifiable data were limited, but the district did report 5.4 years of growth for African American students in a 5-year period.

Resistance to Antibias Training

In recent years, public attention to implicit bias has been brought about by instances such as the arrest of two Black men in a Philadelphia Starbucks coffee shop for simply sitting down to await a meeting with a third individual. Following this incident, the company closed stores to conduct bias training (Hauser, 2018). Pendry et al. (2007) asserted diversity training of this type, usually conducted by an outside agency, often proves ineffective. The outside agencies conducting the trainings often do so based on what they think might work without knowledge of the challenges associated with implicit bias training. Trainings generally follow a model that enlightens attendees about social inequity and White privilege, encourages the company's employees to deny their individual identities by identifying as an employee that adopts the identity of the company, and demonstrates to attendees that they too are biased, usually with the use of the IAT. This is often perceived by attendees as threatening to their own perceived identities, which results in resistance to the training. In addition, these trainings often highlight

individuals' biases without offering suggestions to reduce bias. An inadvertent response to the training is avoidance of intergroup interactions to avoid unwittingly perpetrating bias.

Although there have been recommendations to reduce implicit bias using different programs and computer protocols, there remains resistance to such trainings in teacher education. Cochran-Smith (2010) shared a moving narrative of her experience as a teacher educator at the University of Pennsylvania. Although she felt racism was addressed effectively in the courses she instructed, the following excerpt from her narrative details a moment of reckoning—when she became aware of blindness to issues of racism in teacher education:

> Knowing and sharing the commitment of my program to exploring issues of race, my guest asked in the last few minutes of our two-hour seminar, "And what does this program do to help you examine questions about race and racism in teaching and schooling?" Without hesitation, one student teacher, a Puerto Rican woman, raised her hand and said with passion and an anger that bordered on rage, "Nothing! This program does nothing to address issues of race!" After a few seconds of silence that felt to me like hours, two other students, one African American and one Black South African, agreed with her, adding their frustration and criticism to the first comment and indicating that we read nothing and said nothing that addressed these questions. I was stunned. (Cochran-Smith, 2010, p. 97)

Cochran-Smith (2010) reexamined the processes playing out for her and her students as well as the deliberation informing action toward an examination of teacher education as a racial text. The examination of teacher education as a racial text involved exploration of explicit texts such as courses, course documents, and fieldwork placement. An examination of subtext included exploration of ideas that are not explicitly stated, such as what is missing from the text and what

is included and centered in the text. Employing the CRT tenet of storytelling, Cochran-Smith (2010) explored this method to open conversations about race and racism she thought was "vital to preservice teacher education" (p. 173). The goal of this process was to help preservice teachers connect their background influences to their imminent roles as interpreters of knowledge and meaning constructors in the classroom. In the exercise of examining teacher education as a racial text, Cochran-Smith employed methodologies that included workshops, seminars, personal exploration tasks, and dialogue. Cochran-Smith, however, noted reading the work of theorists, without making personal connections to the theories as a method of excavating our individual histories, serves little in preparing preservice teachers to be culturally responsive in a diverse educational setting. Cochran-Smith did not offer a "here's how to unlearn racism guide," but she did offer insight into what can be a very disruptive and sometimes painful process of understanding how we have been shaped by our habitus and how this can lead to blindness in our vision of ourselves as teachers and blindness to those we teach.

With observations of hostility like those of Cochran-Smith (2010), Sleeter (2017) used CRT to examine teacher education programs' propensity to produce predominantly White educators while having an underrepresentation of minority teacher education candidates. Sleeter addressed the need to recognize and acknowledge that demographic shifts in the U.S. school population necessitate the need for teacher education programs to adapt. According to Sleeter, most university teacher education programs generally offer only one or two programs that address multiculturalism or racial diversity while all other aspects of the curriculum do not address race and ethnicity and cultural diversity, thus deemphasizing the topic's overall significance to all aspects of education. This portrayal of racial issues as occurring in isolation, when in fact they are a very prominent individual and societal shaping factors, only serves to

reduce the topic to “elephant in the room” status with many simply turning a blind eye to its challenges. Noted is the attitude of White preservice teachers toward discussions of race in education. Many often become angry when challenged to grapple with issues of race and, as a result, produce unfavorable instructor evaluations as an outlet for such anger. Sleeter (2017) suggested a path toward self-awareness on which White faculty and preservice students take inventory by examining their “own racial and cultural background” (p. 165), consider the cultural backgrounds of those being researched, engage in dialogue with the community, and understand “how race structures community and school experiences” (p. 165).

Aforementioned are instances where preservice teachers were hostile to being engaged in dialogues about race and racism. The mitigation of implicit bias in the classroom cannot be addressed without the ability to engage in nonhostile dialogue. The following supports the need for these types of conversations and trainings to be a mandated part of teacher training programs. Bryan (2017) engaged the concept of the apprenticeship of observation to describe how biased behaviors are transmitted through “intergenerational lineage and socialization” (p. 329) in the school setting. “As a Black male clinical assistant professor” (p. 326), Bryan (2017) was responsible for student teacher supervision of a predominantly White (85%–90%), middle class, female preservice population. In this conceptual paper, Bryan (2017) detailed how profiling Black male students is passed from the in-service teacher to the preservice teacher and to the students. Used by Bryan to convey the concept of the apprenticeship of observation is the example of Joshua, a young Black boy adopted by his older sister due to his mother’s inability to care for him because of drug addiction. The in-service teacher described Joshua as “failing miserably,” “a behavior problem,” “different,” and “uncomfortable” (Bryan, 2017, p. 328). These descriptions of Joshua were transmitted to the preservice teacher who, while preparing to

lead the students to a resource, instructed they stand quietly in line. When two White boys jumped out of line in the process of playing around, the preservice teacher gently told them to get back in the line. A few moments later, when Joshua did the same thing, he was reprimanded harshly by the preservice teacher. Following the preservice teacher's reprimand, Joshua was faced by and reprimanded harshly by Emma, a White female student who was standing in front of him. Emma in that moment was apprenticed through observation. Emma was transferred messages of bias that would continue to influence how she interacts with Black boys. Joshua was left teary eyed and felt responsible for following the commands of both the preservice teacher and Emma. Bryan suggested preservice teachers experience this same apprenticeship as young students and then again as preservice teachers, thus the cyclical motion of intergenerational transfer of racist and biased behavior against Black students. Bryan (2017) went on to recommend teacher preparation programs "ensure White pre-service teachers have the opportunities to explore themselves as racial beings" (p. 340) to become more self-aware in effort to minimize emotional harm to young children.

As exemplified by Jackson (2018), implicit bias training embodies challenges and pitfalls that should be avoided. Jackson examined the largest implicit bias training program for police in the country in hopes of adapting the police model to expand implicit bias training into other areas. Instead, Jackson used the concept of nonperformative speech acts to demonstrate how the observed implicit bias training may serve to reinforce racism. Nonperformative speech acts are defined by the concept that "the failure of the speech act to do what it says is not a failure of intent or even circumstances but is actually what the speech act is doing" (Jackson, 2018, p. 47). In the case of the police implicit bias training the speech acts nonperform the expectation of reducing bias. Jackson identified eight nonperformative speech acts that reinforce racism. In all

the following instances, racism is verbally opposed but then followed up with examples that reify acts of racism. First, although racism is opposed verbally, it is identified inaccurately as only an individual problem, thus denying racism as a structure in society used to subjugate individuals. Racism and bias are relegated to normal human processes occurring in the brains of individuals. The second is pointing out instances where racial profiling is accurate. Third, instead of identifying racism, it is simply termed differently. In the case of the police training, a caller reports a suspicious Black man sitting in his car in a White neighborhood. Police then justify going to investigate based on a suspicious person report while ignoring the racist aspect of the call. The racist practice has been "masked" by "colorblind racist language" (Jackson, 2018, p. 49). The fourth nonperformative speech act involves "disorganizing behavioral prescriptions about how to act against racism" (Jackson, 2018, p. 49). This is exemplified by trainers using the science of the speedy response of the unconscious brain, where bias is processed, to encourage one to slow down and reevaluate but then point out slowing down may cost valuable seconds as indicated by a contradicting study. The fifth act of nonperformance reassured trainees they were not responsible for any racist beliefs or acts because these are a part of human nature and a process of the brain. Citing Jim Crow laws as an example of police letting themselves off the hook for having to uphold unjust laws, and thus suggesting community trainings need to be conducted to educate the community on the conflict police face when they must follow the law, is the sixth example of nonperformance of the speech act. The seventh nonperformative speech act is the conflation of racism and bias. The final act of nonperformance is the idea that the training now leaves officers in the privileged position of being experts on bias and racism (Jackson, 2018).

The Challenge to Postsecondary Education

The aforementioned studies have attempted to mitigate the impact of explicit and implicit biases through education. The work of mitigating implicit bias with measurable outcomes is challenging. Bargh (1999) described the "rigidity of automatic processes . . . as a 'cognitive monster' that is deep rooted, immune to social pressure, and resistance to the influences of deliberate processes" (as cited in Forscher et al., 2019, p. 42). In a meta-analysis of 492 implicit bias studies with 87,418 participants, Forscher et al. (2019) found "implicit measures can be changed, but the effects are often relatively weak" (p. 1), with most studies realizing only short-term changes. Forscher et al. (2019) suggested "future research should innovate with more reliable and valid implicit, explicit, and behavioral tasks intensive manipulations, longitudinal measures of outcomes, heterogeneous samples, and diverse topics of study" (p. 545).

Although not perfect, the PK–12 educational setting has put trainings in place to make teachers aware of biases and their impact. Instructors in postsecondary education are content area specialists and do not have the benefit of pedagogical training, which likely puts them at a disadvantage in creating equitable learning environments. The literature does not suggest postsecondary instructors are required to complete mandatory cultural sensitivity training or targeted implicit racial bias training. As researchers have indicated (Clark & Zygmunt, 2014; Fiarman, 2016; Staats, 2015; Westerberg, 2016), awareness and mitigation of implicit racial bias is often left to the individual educator to explore. Postsecondary settings generally offer seminars, teach-ins, author talks, and other attendance-voluntary events, highlighting the need to address racism, prejudice, racial insensitivity, multiculturalism, implicit racial bias, and related topics. After the events, the instructor is left once again to self-assess to gain awareness of their unconsciously motivated practices and institute mitigation strategies. Recall the work of

educators and researchers emphasizing the hostility and resistance associated with race, racism, and implicit racial bias examination (Cochran-Smith, 2010; Jackson, 2018; Schroeder et al., 2013; Sleeter, 2017) to question the use of self-assessment in mitigating the negative impacts of implicit racial bias.

Although the review of literature presented here discusses negative experiences and the attrition of Black students in STEM majors, not examined fully in the literature is the role of instructors' implicit racial bias and its potential impact on the retention of Black students in STEM majors. Considering the disparity in the retention rates for Black students, the need exists to investigate obstacles to continuation in STEM majors and propose avenues to reduce attrition and increase the number of Black students retained in STEM majors. With the implication of implicit racial bias in disparate treatment and experiences of Black students, the identification of implicit racial bias of instructors may be an important step to improved engagement and thus the retention of Black students in STEM majors. The objective of identifying and mitigating implicit racial bias is to improve Black students' experiences by attenuating feelings of isolation and improving connectedness and opportunities for engagement in all aspects of STEM education.

CHAPTER 3 – RESEARCH METHODOLOGY AND METHODS

Purpose of Research

A qualitative research study design was used to explore whether a researcher–instructor partnership brings awareness and the potential for mitigation of the impact of racial implicit bias in course delivery and instructor interaction with Black students in STEM classes. The study explored the following research questions:

1. What factors contribute to instructor participation in a researcher-instructor partnership to explore implicit racial bias in course delivery and instructor-student interactions?
2. How does researcher feedback influence instructor-student interactions and course delivery?
3. What are instructors' perceptions of the researcher-instructor partnership?

Qualitative Case Study Methodology

The method of inquiry selected for this study was a case study research design. As Yin (2018) defined, a case study "is an empirical method that investigates a contemporary phenomenon in depth and within its real-world context" (p. 15). The type of case study selected for the present study was the collective case study model (Creswell, 2013). In the collective case study model, a single topic is selected, and multiple cases from one site are used to garner multiple perspectives on the phenomenon. Schoch (2016) detailed studies using multiple cases

should aim to enroll 3 to 6 participants to maintain manageability. Case studies are bounded by location, space, and time and rely heavily on multiple sources for evidence (Creswell, 2013; Schoch, 2016; Yin, 2018).

The present study investigated the phenomenon of implicit racial bias with a focus on awareness and mitigation. The study's context was defined and bounded by the location of an urban university, the space of a STEM classroom, and the timeframe of 7 weeks during a traditional semester. Depth of analysis was achieved by using multiple points of data collection, including a survey tool, direct observations, semi structured interviews, and course documents.

Setting

This study was conducted at a large, public, urban university with a Research 1 (R1) designation, which indicates very high research activity. The university is in the mid-Atlantic region of the United States where underrepresented minorities (URM; African American/Black, Native American, Alaska Native, Latino, Hawaiian/Pacific Islander, and persons of two or more races consisting of at least one of the URM categories) make up 30% of the student population. At the time of this study, Black and African American students made up 18.5% of the student population (Forbes, 2019). This diverse university reported 23% of its students were enrolled in STEM majors, which made probable a significant representation of Black students enrolled in STEM courses selected for this study. The university is reported to value and embrace diversity, equity, and inclusion.

Data Collection and Data Analysis

The study was divided into three phases: survey, observations and weekly meetings, and final interviews. Data collection and analysis was completed in each phase. Data collection in prior phases was used to inform collection in subsequent phases. Use of multiple methods of

collecting data—a survey tool, observations, and interviews—allowed the researcher to gain a deeper understanding of how instructors' perceptions and beliefs (survey) aligned with actions (observations), and explicit expressions (interview; Creswell, 2013; Greene, 2007; Maxwell, 2013; Schoch, 2016; Yin, 2018).

Phase 1 – Instructor Survey

Survey Data Collection

A survey instrument (see Appendix C) was developed to gather information to answer the research questions. Individual survey items were developed to ascertain instructors' knowledge of implicit racial bias and its impact on Black students in the classroom. The study's research questions guided development of survey questions, which consisted of Likert-type items to gauge instructor perceptions and fixed-alternative items to gather descriptive statistics. The final survey question was an open-ended question that asked instructors about their willingness to participate in the Phase 2 of the study. Three drop down boxes were offered. The instructor could (a) opt to join Phase 2 of the study by providing contact information, (b) request more information by asking questions or providing an email, and (c) opt not to participate in Phase 2 of the study and express reasons for their objection to further engage in the study.

The initial survey question was designed as a qualifier (Mitchell & Jolley, 2012) to ensure the respondent was a STEM instructor and to identify the specific course or courses taught by the responding instructor. If the respondent was not a STEM instructor, the respondent was directed to the end of the survey and data collection was terminated. The latter questions of the survey were designed to gather the respondent's demographic information, including years of teaching and race. Demographic questions were placed strategically at the end of the survey to

reduce anxiety often associated with the topics of bias and race (Mitchell & Jolley, 2012). The final question of the survey was designed to recruit instructors for Phase 2 of the study.

Prior to survey distribution, the proposed survey was piloted to a select group of three individuals based on their knowledge of and proximity to the research topic. Survey feedback was gathered from a research and evaluation professional, an educator, and an educational equity researcher. Feedback was evaluated and, when appropriate to the goals of the study, incorporated to ensure the survey was worded clearly, demonstrated a logical flow of questions, and would gather the intended information. As a result of the feedback, racial and ethnic categories on the survey were aligned with federal guidelines for Race and Ethnic Standards for Federal Statistics and Administrative Reporting (Office of Management and Budget, 1977). The directive instructs on minimal acceptable categories to identify race and ethnicity.

Research Electronic Data Capture (REDCap), a secure web application, was used to build, administer, and manage survey responses (Harris et al., 2009). REDCap is IRB approved as a secure method to collect and store survey data.

Survey Data Analysis

Survey data were managed using REDCap. The survey link remained active for 2 weeks. Once the survey link closed, descriptive statistics were generated. In addition to descriptive statistics, survey responses completed by instructors enrolled in Phase 2 were explored further during the initial weekly meeting in Phase 2 of data collection. Additional instructor-specific and clarifying information was gathered pertaining to survey responses.

Phase 2 – Weekly Observations and Meetings

Data Collection

Phase 2 consisted of multiple methods of data collection, including class observations, course document review, weekly meetings, and instructional strategies discussions. Embedded in the process of data collection methods was the goal of relationship building between the researcher and instructor, as the relationships was an integral component of a successful partnership. All processes pertaining to methods of data collection and relationship building served as the basis for Phase 3 data collection.

Once Phase 2 participants were identified from the survey responses, each instructor was contacted by email to welcome them to the study and provide a timeline for the next step. Two weeks before the start of the semester, each instructor was sent a study protocol informational email (see Appendix F). Included in this email was a request for each instructor to provide day and time options for a weekly meeting. Meeting times were agreed to and confirmed by email. The first weekly meeting was scheduled on the days following the first class observation but before the second observation was conducted. When possible, the final interview (Phase 3) was scheduled at the same time the first and subsequent weekly meetings were scheduled.

Observational Protocol. An observational protocol (OP; see Appendix D) was developed to guide data collection during classroom observations. The OP guided the recording of interactions between the instructor and student prior to the start of class, during instruction, during breaks, and after the conclusion of class. Specific details captured included the race of the student (based on visual observation) engaging in the interaction when visually categorizable, who initiated the interaction (the student or the instructor), and a description of the interaction. The OP also detailed the number or approximate number of students in attendance and the

number or approximate number of Black students in attendance. Data collected using the OP were analyzed and reviewed during weekly meetings with instructors.

Classroom Observations. Class observations began the 1st week of the semester. Class observations and weekly meetings were conducted over a 6-week period. One class session of the selected courses was observed each week for classes meeting twice a week for 1 hour and 15 minutes. Classes meeting for 50 minutes, three times a week were observed twice a week to accommodate for the time difference with classes meeting for longer periods of time and instruction time lost to announcements and similar class housekeeping. Observations were not conducted on test days unless the test was a short, timed test; in such instances, observations were conducted at the conclusion of the test.

During Phase 2 observations, the OP guided the researcher to gather both qualitative and quantitative data from observations of classroom instruction and interactions. Observations included those of instructor-initiated engagement with students and student-initiated engagement with the instructor. Because Black students often report feeling isolated and ignored (McGee, 2020), the researcher collected data on the number and types of engagements with the professor. The researcher also noted which students, in terms of ethnicity, initiated engagement, and with whom the professor initiated engagement. Interactions were noted not only during instructional time but also during breaks, before class, and at the end of class. Detailed field notes (Saldaña, 2012) were taken to capture the essence of these interactions. The researcher completed a researcher memo following each observation to ensure integrity of recall in capturing impressions. Analytic memos (Saldaña, 2012) were generated from the field notes at the end of each class session.

Additional qualitative data were gathered through examination of visual media presentations during class instruction. Course visual media presentations were evaluated qualitatively for equity in representations of images exemplifying diversity. Diverse representations may have included diverse visual images and course content reflecting issues relevant to Black students and their communities. Syllabi were also used to gather information on diversity, equity, and inclusion.

Weekly Meetings. Weekly meetings provided the opportunity for relationship building, discussion of classroom observations, and researcher–instructor collaborative learning opportunities. Each instructor was offered the option of participating in weekly meetings in person or virtually. All instructors opted for six in-person weekly meetings that spanned, on average, 30 to 45 minutes. The first weekly meeting occurred after the first class observation, which allowed the researcher to collect observational data before the meeting. The initial data collected included goals for the course, syllabus review, approaches to attendance, test taking, and student engagement in areas such as extra help and office hours. Gathering this information before the initial weekly meeting gave insight into the instructor's approach to instruction and overall course delivery.

The first weekly meeting was designed as a relationship builder. Researcher humanization and positionality was conveyed through sharing demographic, educational and employment background, familial relationships, and aspirations for use of the research.

During scheduled weekly meetings, the researcher shared classroom observations with each instructor and sought clarifying details when necessary. The researcher and the instructor engaged in collaborative analysis of the observations. Weekly meetings also served as a form of member checking to ensure accuracy in interpretation of actions and interactions. Weekly review

sessions were audio recorded and transcribed for accuracy. Not all instructors were comfortable being recorded; therefore, the researcher relied on field notes taken during those meetings. Additionally, researcher memos were completed after each meeting. Analytic memos were completed using field notes and researcher memos.

Instructional Strategies. In addition to discussion of class observations, weekly meeting sessions were used as opportunities to take an instructional approach to bringing awareness to how implicit racial bias could become implanted and practical strategies to minimize its impact. Instructional strategies included use of vignettes and teaching strategies and a test of terms related to diversity, equity, and inclusion. Instructional strategies were designed to offer real-life examples drawn from the work of educators and researchers.

Vignette 1 (see Appendix F), Grandmother's Impact, illustrated how implicit bias becomes embedded and how elusive it can be to identify the bias before it manifests. Vignette 2 (see Appendix G) was shared to exemplify students bringing their own experiences from K-12 interactions with teachers into higher education classrooms. Vignette 2 highlighted the importance of not making assumptions about student disposition, as such assumptions may be influenced by stereotypes that have the potential to power implicit bias. Both Vignettes 1 and 2 were generated from the researcher's experiences. Vignette 3 (see Appendix H) was used to demonstrate the need for and to encourage instructors to examine their positionality as leaders in the classroom and how that positionality may impact course delivery and instructor–student interactions.

Examples from academic writings that were illustrative of inclusive teaching practices were adapted (see Appendices I, J, and K) and used as informational resources exemplifying strategies to mitigate implicit bias. The instructional strategies were used to offer the instructor

practical tools to incorporate into course delivery. The strategies (see Appendices I and J) were discussed during weekly meetings. The test of terms related to diversity, equity, and inclusion (see Appendix K) was shared as a self-check tool and was not used to establish a baseline of knowledge nor further investigated.

Data Analysis. Data analysis was conducted as an ongoing process as data were collected (Creswell, 2013). The data analysis process included detailed descriptions based on reviews of field notes and memos, data collected using the OP, and weekly meeting notes. Inductive analysis was used to generate codes and organize codes into themes.

Weekly meetings were recorded and transcribed. In instances when recording was not permitted, detailed field notes were used for analysis. In vivo coding was used to analyze transcripts and field notes. Using in vivo coding allowed the researcher to use participants' actual words as codes, thus ensuring greater authenticity in the alignment of meaning by reducing researcher interpretations (Manning, 2017; Schoch, 2016). Data were read and reread to allow the researcher full immersion in the data. Key words were highlighted, and codes were generated. A sample of instructor quotes, coding, and thematic assignment is shared in Figure 4.

Figure 4

Sample of Coding Procedures

Quote Sample	Code	Theme
I like the students and I care for them	care	
Is there some way I can help	help	
The bigger the class, it gets harder to track individuals	track	
I tried to give students a lot of different way to do well	help	Ethic of Care
I see the oppression. I understand it now. How do I help?	help	
I am here to try and help lift you up and over	help	
If you're struggling, let's talk	care	
I recorded a video, a Zen garden, told them to close their eyes. A pep talk before the exam. I enjoyed doing that.	care	

A detailed analysis of the OP also provided data useful in developing codes. The OP was used to record classroom activities. Activities included student–instructor interactions, student–student interactions, instructor movements and actions within the classroom space, as well as words spoken and messages conveyed. In conjunction with the OP, additional detailed field notes were taken that expounded on data tallied in the protocol.

Use and Purpose of Themes. Themes were developed from weekly observations and discussed in weekly meetings. Some themes were generated based on the collaborative processing of observations or based on researcher analysis of instructor commentary. Although some themes developed were not wrought from observed instances of implicit bias, the themes emerged through synthesis of class characteristics and dynamics as well as how the instructor's teaching style emerged within the setting. Discussions centered on how themes contributed to or mitigated implicit racial bias. Based on emerging themes, resources detailing instructional strategies were shared with the instructor.

Phase 3 – Final Interview

Data Collection

Semistructured Interview Protocol. A semistructured interview protocol (SIP; see Appendix E) was developed to guide the final interview with instructors who participated in the researcher–instructor partnership. The SIP was designed to capture instructors' perceptions of the partnership, attain feedback on the most beneficial aspects of the partnership, and obtain suggestions to improve benefits of the partnership to instructors.

Interviews were conducted at the end of the 6-week observation period. The goal of the final interview was to gather data on the instructor's perception of the partnership. The SIP was used to guide the final interview. Each interview was audio recorded and transcribed, except for

one, as the instructor objected to being recorded due to the sensitive nature of the topic of implicit racial bias. The primary goal of the interview was to determine if the researcher–instructor partnership was beneficial to the instructor, to gather instructor suggestions to improve the partnership, and to determine whether changes would be made to instruction because of the partnership.

Data Analysis

Audio recordings of the interviews were transcribed. Analysis of interview data consisted of coding to determine emerging themes. Although coding was used to categorize and simplify the data, it also was used as a component in the larger strategy of narrative and connecting analysis (Maxwell & Miller, 2008).

Recruitment

The recruitment process began with a review of the plans of study listed on the university's website for the following STEM majors: biology, physics, chemistry, engineering, and mathematics. Each plan of study was reviewed. Introductory classes and subsequent classes of each major were identified as possible options for study. A nonprobabilistic purposive sampling of instructors of biology, physics, chemistry, engineering, and mathematics were identified as potential study participants. Each department chair in five major fields of study in STEM was identified using the university's website. Nine department chairs were contacted by email and asked to forward the study invitation email (see Appendix A) containing a study information sheet, consent document, and the electronic survey link to instructors in their departments. Six department chairs forward the email to instructors in their department. One department chair requested the researcher to send the email directly to the department's instructors. After a follow-up email, two department chairs remained unresponsive. The

researcher directly emailed the instructors in those departments. A total of 268 electronic surveys were distributed to instructors of biology, physics, chemistry, engineering, and mathematics.

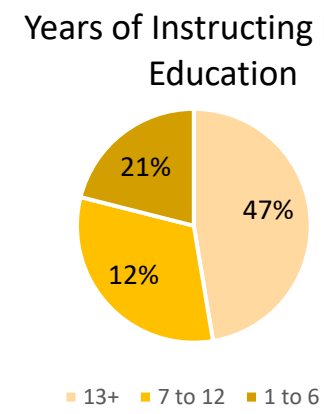
The survey instrument was used to collect information specific to the research questions and to recruit participants for Phases 2 and 3 of the study. The survey is discussed in detail in the Data Collection section of this chapter. Detailed here is the recruitment function of the survey, which was designed to gather descriptive data and information on implicit racial bias and to recruit instructors for Phase 2 of the study. Attached to the email invitation was the study information and consent form (see Appendix B). The final question of the survey provided instructors three options: continue to Phase 2, decline further participation, or request more information. Each option offered a drop-down window to provide contact information, questions, commentary, or reason for decline.

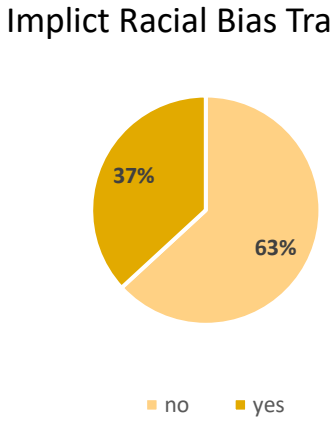
Participants

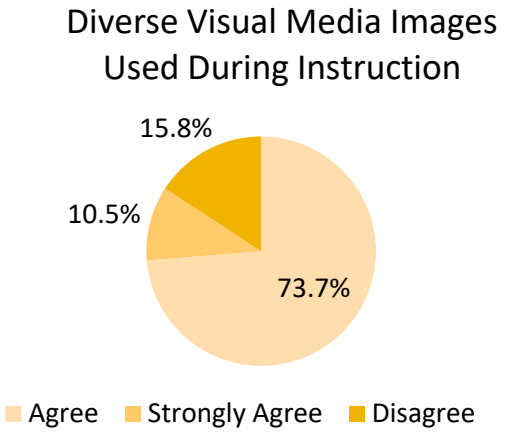
The surveys experienced a 7% return rate with 19 of 268 surveys completed and returned electronically. Despite having a low response rate, descriptive data were compiled as relevant and pertinent to answering the research questions and directing future studies. Descriptive data (see Figure 5) showed 37% of responses were received from engineering instructors, followed by 26% from chemistry instructors. Biology and math instructors each accounted for 16% of survey responses. No survey responses were received from physics instructors. Forty-seven percent of respondents reported at least 13 years of experience teaching STEM courses at the college and university level. Respondents teaching for 7–12 years and 1–6 years comprised 32% and 21% of the returned surveys, respectively. Most respondents, 63%, reported having no implicit racial bias training; however, 100% of respondents agreed (80%) or strongly agreed (20%) they understood the phenomena of racial implicit bias.

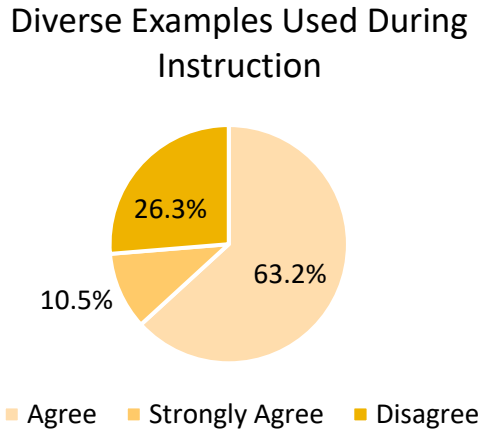
Figure 5

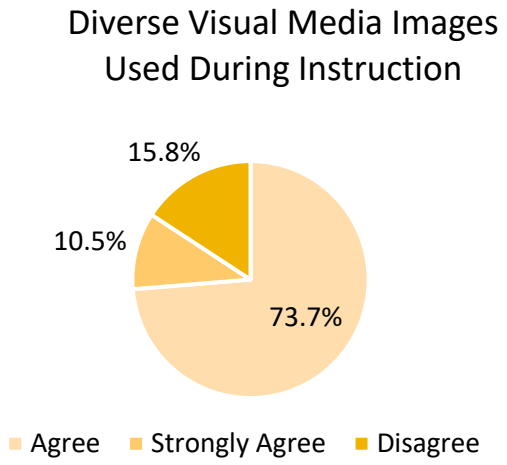
Survey Participants

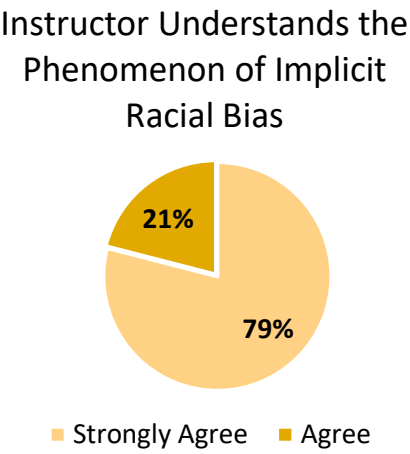












The final question of the survey asked respondents to indicate their interest in participating in Phase 2 of the study. Three respondents completed the survey and immediately selected the "Yes, sign me up" option. More information about the study was requested by 13 respondents (68%). Of those who requested and received additional information, two opted to continue to Phase 2. One respondent requesting more information offered this comment:

> It seems like there should have been an additional "not applicable" choice for how we deal with racial bias in class. Agreeing or disagreeing doesn't make sense in most math classes when all content is about numbers and nothing to do with people and their races.

Three survey respondents completed surveys and declined continuing to Phase 2; however, only one respondent offered a reason: "Teaching is not valued for tenure."

Attrition and Participants

Five instructors chose to join Phase 2 of the study initially. Prior to the start of Phase 2, 1 of the 5 participants withdrew from the study. The instructor indicated it was a busy time and weekly meetings "may be too much." The instructor agreed to participate in a brief exit interview. An initial and follow up email was sent to schedule the exit interview. Both received no response; thus, no further attempts were made to gather more data on the obstacles influencing the attrition.

Four instructors, three White males, and one White female continued to participate in Phase 2 of the study. Of the four instructors, two were tenured, and two were in tenure-track positions. Three of the four Phase 2 participants indicated they had not had implicit racial bias training. One of the three stated he read on his own to get an understanding of situations presented in society but expressed interest in dialoging about the readings. The fourth instructor

who did have implicit racial bias training received the training at another university prior to their current setting.

Phase 2 Participants – Special Consideration

Phase 2 participants were observed in the context of their classes with enrolled students present. Though students were included in the context of the study because they were the recipients of the instructors' instruction and the observed interactions, there was no direct research-based interaction between the researcher and the students nor did the study create disruption to the learning environment. Additionally, no student identities were revealed in reporting the final study results.

Based on the aforementioned criteria and the ensuing considerations, the present study was IRB approved for deception regarding the research topic of implicit racial bias. Information on implicit racial bias was withheld from students. Revealing that observations would focus on implicit racial bias may have influenced student behavior and potentially skewed the data. In addition, revealing the role of the researcher and topic of study may have compromised instructors' confidentiality as they participated in the study. It was important to protect instructors' confidentiality because of the sensitivity of the topic. Instructors entered the study voluntarily and, it may be assumed, as a method to explore avenues to improve instructional practices. The risk of potential harm, or repudiation, to instructors was eliminated with the approval to withhold study information.

Dependability and Trustworthiness

Before the survey was administered to instructors, it was piloted to a research and evaluation professional, an educator, and an educational equity researcher to ensure its reliability. Feedback was sought to ensure the clarity of instructions and questions and the logical

flow of questions. The pilot was conducted in a participatory method to gather and engage commentary, questions, and suggestions. The pilot ensured adequate and appropriate data were gathered to answer the research questions.

In accordance with Guba's (1981) criteria to achieve trustworthiness, the following steps were taken. Every effort was made to communicate the research setting, population, and procedures clearly. Multiple sources of data collection (i.e., survey, observations, interviews) were used. Study protocols were developed to ensure data were collected in the same manner from each participant. A detailed chain of evidence was maintained to facilitate in depth analysis and review (Yin, 2018). Detailed communication of procedures and protocols also contributed to the ability of the study to be replicable.

Phase 2 observations and Phase 3 interview data were subjected to respondent validation, often referred to as member checks (Maxwell, 2013), to ensure accurate representation of observations and interview responses. Respondent validation provided a safeguard against potential misinterpretations by the researcher and conversely as evidence of accurate accounting by the researcher. This also served to identify potential researcher bias.

Human Subjects Protection

All required approvals were obtained from the university Institutional Review Board (IRB) prior to recruitment. Participants, upon invitation to the study, were supplied with an informed consent document detailing the aims of the study. Participants were enrolled on a voluntary basis and informed of the option to discontinue participation at any time during the study. Participants were assured their information would be kept in the strictest of confidence and the final report would contain no identifying information.

Researcher Positionality

My positionality in this research was shared with each instructor during initial introductions at the first weekly meeting to build a transparent researcher–instructor partnership. I communicated my position as a Jamaican born, naturalized citizen of the United States, a wife, and a mother of six children (five girls and one boy) who would be categorized as Black or African American. My training and experience, not only as a researcher but also as a child and family preservation social worker, prepared me for extensive interactions with individuals from diverse backgrounds and experiences, which helped me to hone interview, observational, and relational skills to center individual voices and experiences.

CHAPTER 4 – FINDINGS

This chapter presents data related to whether a researcher–instructor partnership brings awareness and the potential for mitigation of the impact of racial implicit bias in course delivery and instructor interaction with Black students in STEM classes. Strategies used in the development of the partnership during weekly meetings included relationship building, review of classroom observations, and presentations of implicit bias mitigation tools and strategies.

The study explored the following research questions:

1. What factors contribute to instructor participation in a researcher-instructor partnership to explore implicit racial bias in course delivery and instructor-student interactions?
2. How does researcher feedback impact instructor-student interactions and course delivery?
3. What are instructors' perceptions of the researcher-instructor partnership?

Phase 2 – Weekly Observations and Meetings

Phase 2 findings were derived from class observations and weekly meetings. Data from class observations and researcher–instructor interactions during weekly meetings informed Phase 3 interviews. The following themes, reported by course, emerged over the 6-week observational period. Course names, STEM Class 1, STEM Class 2, STEM Class 3, and STEM Class 4, are

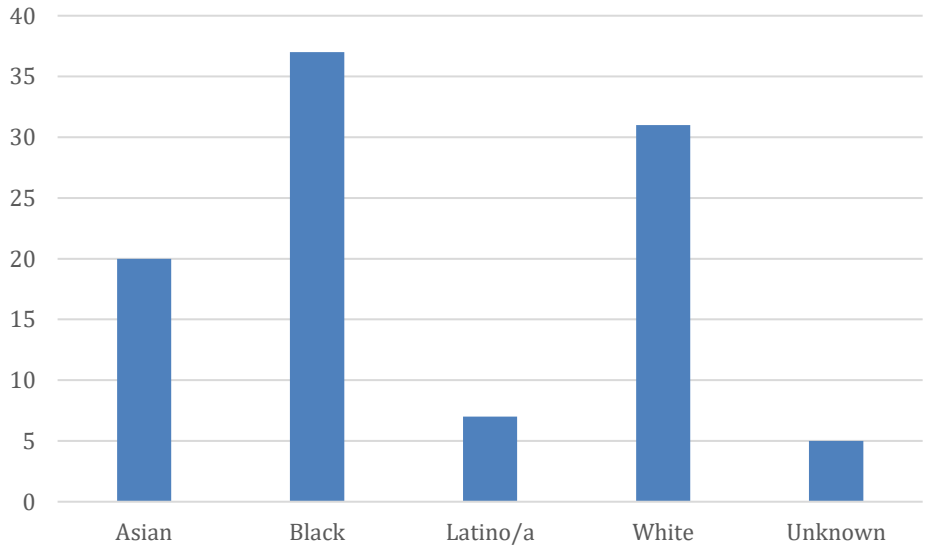
fictitious and were assigned by the researcher to ensure instructor anonymity. STEM Class 1 and STEM Class 3 are undergraduate and graduate courses, respectively, in the same STEM department. Pseudonyms were used in place of instructors' names to maintain confidentiality.

STEM Class 1

STEM Class 1 (SC1) was an undergraduate course that enrolled over 100 students. Most enrolled students were sophomores followed by juniors. Of the four courses enrolled in the study, SC1 represented the most diversity in student enrollment (see Figure 6). The instructor of this course, Dr. Picard, was tenured with over 13 years of instructing university courses. The themes that emerged for this course, based on classroom observations and weekly meetings, were ethic of care, proximity, fostering a safe space, democratic education, affinity bias, and apologetic discomfort.

Figure 6

SC1: Class Composition by Percentage



Note. A diverse class makeup is represented with Black students comprising most of the class.

Ethic of Care. The course instructor demonstrated an ethos of caring for students, many of whom aspired toward advanced and medical degrees. Dr. Picard encouraged students to get to know their classmates by orchestrating "get to know you" activities during the first class meeting. Additional get to know you activities were facilitated to encourage students to build a support community. Students were encouraged to share email addresses.

Dr. Picard shared some students indicated they were uncomfortable raising their hands to ask questions. In response to these students, the instructor created inclusivity Jamboards (a digital Whiteboard used by the class for real-time collaboration, questions, and responses), which allowed more students to participate.

In addition, Dr. Picard used groups to reduce isolation and increase opportunities for students to find connectedness. One group activity conducted at the beginning of a course, during the 2nd week of class, was based on sharing ideas in response to the question, "If you won a million dollars, and you had to give half to your favorite charity, which one would you donate to?" Additional questions encouraged students to share "your favorite holiday and why" and "which reality TV show you would like to appear on."

Ted Talks were used to offer encouragement and useful self-help strategies. The first Ted Talk was shared during class. Ted Talks were scheduled to begin 15 minutes before the start of class for those who were interested in attending. A later Ted Talk, however, was shared during class to offer a resource with information that, if heeded, may improve academic performance. Students were given a quote from the Ted Talk as a prompt. For extra credit, students were encouraged to respond to the prompt on the class's Canvas platform by listing three gratitudes and one positive experience in the last 24 hours. Although not related to the day's academic topic, the goal was to give students tools to improve academic performance.

Dr. Picard acknowledged challenging material and vocabulary in chapter readings. This acknowledgment was received with verbal agreement and head nods by a large portion of the class. Public admission of challenges potentially faced in grasping content may serve as a strategy for reducing psychological barriers. Student observation that classmates experience challenges may serve to reduce anxiety, stereotype threat (Steele & Aronson, 1995), and imposter syndrome (Chrousos & Mentis, 2020).

Proximity Encouraged Interactions. Dr. Picard made a point to move from behind the computer station located at the front left of the room (if viewed standing in the back of the room) to among the students using the lecture hall's tiered aisle. Two tiered aisles divided the lecture hall seating into three seating sections (see Figure 7). Four types of interactions were observed. Observed interactions included those occurring when Dr. Picard was close to students, her response to a raised hand or to a voice calling out an answer or question, and one-to-one interactions occurring at the front of the room (at the computer station) before and after class.

Figure 7

SC1: Lecture Hall Diagram

Note. Lecture hall depicting aisles.

Observations revealed movement among students during lectures generated interactions based on proximity. As Dr. Picard moved up and down the aisles and made eye contact with students, students seemed more likely to interact by sharing a response. In the 2nd week of class, when Dr. Picard moved up and down the left aisle, most questions came from the left side of the room. Conversely, when she traversed the right aisle, proximity-initiated questions from the right side of the room. In the final observation, in the 6th week, data showed if Dr. Picard was in one aisle, students seated on the opposite side of the room did not offer responses until the instructor traversed the aisle along which they were seated.

SC1 was comprised of mostly Black students. Classroom observations showed overall interactions were dominated by White students (31% of the class), with 43% of all interactions followed by Black students (37% of the class), accounting for 22% of all interactions. Observational data revealed Black students were more likely to interact with responses and questions when the instructor was in proximity. When combined, one-to-one interaction with the instructor, at the front of the class either before and after class, and responses during the lecture when the instructor was in proximity, accounted for 75% of Black student interactions. In addition to observational data conducted during class, the instructor reported during the second weekly meeting that only minority students up to that point had made office hours appointments. The number of Blacks students within the minority students requesting office hour appointments was not reported.

Fostering a Safe Space With Diversity, Equity, and Inclusion Statement. Dr. Picard chose not to place a diversity and inclusion statement in the syllabus but rather to engage the class in creating a statement together. She felt "authenticity was important" in creating a statement, so she asked students to share what diversity and inclusion meant to each of them via a virtual response platform. From the information gathered, the instructor created the following model of inclusive excellence and presented it to the students at the end of a class:

> The [university] community is committed to creating and sustaining an educational environment that prioritizes inclusive excellence. Our classroom will strive to model this mission by embracing the diversity and uniqueness of all participants. We welcome vulnerability, providing a safe environment where everyone feels comfortable expressing themselves without judgment or bias. During times of struggle, we will be respectful and compassionate, ensuring that everyone is given an equal opportunity to benefit from this

academic discovery. We will serve as models of transparency, humility, and kindness as we embrace this journey of both personal and intellectual growth.

The model of inclusive excellence received some applause as well as some disengagement as evidenced by students' heads being down looking at laptops or phones. As the applause concluded, one White male student raised his hands in the air, stretched, and yawned.

Democratic Education. In a democratic approach to education, "students have the opportunity to learn as part of a community in which they have a voice and can participate in making decisions" (Allen, 2011, p. 3). Dr. Picard's use of democratic education is connected closely to the demonstrated ethic of care in that democratic activities were designed to give students a voice to express what worked, what did not work, and what may be most beneficial. A democratic style was first noticed after the first exam when a Mentimeter (Menti) survey—an interactive online platform used to engage groups in question answering, polls, and quizzes (Mentimeter, 2021)—was posed to the class to get feedback on perceptions of the exam.

With the second exam approaching, another poll was presented to gather feedback on day preferences for taking the exam—on a Friday or Monday. Poll results indicated most students preferred to have the weekend to study and preferred a Monday exam. Dr. Picard, using the poll data, set the exam for Monday.

Affinity Bias. At the start of the semester, Dr. Picard divided the class into groups that completed group assignments both during and outside class time. Dr. Picard, who was concerned about the importance of group dynamics, asked the researcher to monitor nearby groups during group activities. This activity did not impact observations pertaining to the instructor and the study's original design, as Dr. Picard generally remained in the front to facilitate the activity, and students were primarily engaged with group members.

The class was divided into approximately 20 groups. The researcher selected a group for observation based on proximity to the researcher and group diversity. Initial observations resulted in a lack of clarity as to who and how many were in the group. It was clear that two White males and one White female were a part of the group due to their proximity in seating and regular conversations. A Black female was seated close by and appeared to be a member of the group; however, no interactions with the other three members took place during the first observation session. The second observation of the group raised additional questions as the Black female was no longer present. During the weekly meeting with Dr. Picard, clarification, which was sought about the groups, revealed groups were composed of 6 to 7 members. The next class observation focused on the three identifiable members in hopes of making a clear connection to four other potential members of the group.

Dr. Picard's clarification and additional observations confirmed the initial three—the two White males and the one White female—were members of the same group as were the four minoritized females who sat in the row in front of the three initially identified members. The initial Black female appeared to have inconsistent attendance. The cohered group consisted of two Black females, two females who appeared to be of Middle Eastern descent, and the three initially identified White members. The group was slightly divided in physical space. The minoritized female members sat in the last row of seating in the established lecture hall seating. The three White members of the group sat up against the back wall of the lecture hall. A walkway behind the last row of established seating placed a physical separation of about 3" between those seated in the last row and those seated along the back wall. There was a clear lack of communication between the two divisions, which was shared with the instructor during the weekly meeting.

In the next observation, after all members of the group were identified, the instructor introduced a team activity using Menti. The group was again divided with the four minoritized female students (MFS) in the last row of theater seating and the two White males (WM1, WM2) and one White female (WF) students seated along the wall. The group activity began with students sharing their favorite class and a class they were looking forward to taking. One of the four MFS turned around and began the conversation. WM1 did not respond but was engaged by the WF, at which point he conversed with her.

After the initial activity, Menti was used to present questions to the team. There were 10 opportunities for interaction among group members as questions were presented on the Menti platform. Group member interactions are noted here, with each number representing a new question or activity given by the instructor:

1. Initial activity was noted above.
2. Teams first needed to select a team recorder. Members of the group did engage to make this decision. One MFS was selected as recorder.
3. The discussion was initiated by all the MFS turning around to engage in discussion. There was more interaction here than noted in Activity 1.
4. This Menti-presented question resulted again in the discussion being initiated by the MFS. Collaboration was minimum.
5. Initiation of the discussion came from the MFS. Some discussion was noted.
6. Minimal discussion was noted.
7. For this question, the instructor noted faster responses yield more points. The discussion began among the MFS. The MFS turned to the back row and asked, “What

do you think?" No audible responses were noted to accompany facial expressions and bodily communications such as shrugged shoulders.

8. A clear distinction between members began to become more evident. The MFS discussed the question among themselves. The WM1, WM2, and WF discussed the question among themselves. Again, the collaboration represented that of Activity 6.
9. There was no collaboration between the two divisions of the group. The WM1 and WF had their heads down as they were on their phones.
10. The MFS collaborated among themselves. They looked back to engage in collaboration by asking, "What do you think?" WM2 and WF stayed on the phone, never looking up.

The final observation of this group occurred during review of the first exam. Groups were convened to practice commonly missed questions on the exam. The WF was missing from the group. The MFS worked together, and WM1 and WM2 worked together. A short time after work started on the question, WM2 moved his chair closer to the MFS and joined in collaboration. WM2 seemed to prompt WM1 with visual and hand gestures to join the group; however, WM1 did not participate initially. Once WM2 joined the MFS, they were very inclusive of him.

Apologetic Discomfort. Dr. Picard integrated diverse issues and examples into the SC1 curriculum successfully. The topic of sickle cell anemia was included in a lesson on genetics. Presentation of this disease was accompanied by supplemental readings about its impact on those who have the disease, focusing primarily on two families. Information was shared about promising research being conducted on the disease. Sickle cell anemia primarily affects people of sub-Saharan African descent at about 80% of all cases, but it also affects people of Indian (South Asian), Saudi Arabian, Turkish, Greek, and Italian descent (CDC, 2020). Notably, the

instructor took time to address an issue impacting primarily Black Americans. By addressing this issue in class, Dr. Picard offered actions counter to Black students' complaints, as detailed in the literature, that issues impacting their communities are discussed rarely in STEM classes (McGee & Bentley, 2017). Dr. Picard noted nonverbal cues of affirmation from Black students in the class in the form of eye contact and head nods. At the conclusion of the presentation, however, the instructor seemingly adopted an apologetic tone for taking time to discuss the topic by stating the following: "I hope you didn't mind me taking time to talk about this." During our following weekly meeting, the instructor noted some students complain about culturally specific topics, especially when it is not an item detailed in the syllabus, knowledge of which the student did not need to complete exams.

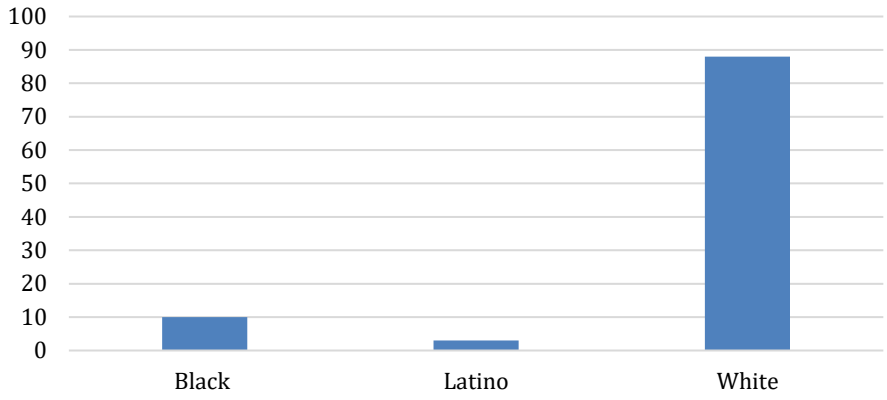
STEM Class 2

STEM Class 2 (SC2) was a graduate-level STEM elective class comprised of students with diverse educational and professional backgrounds. Enrolled students were primarily graduate student professionals working in the designated STEM field and upper-level undergraduates. The class offered a dual modality where students could join via a virtual platform or in person. Approximately 90% of students chose the online platform with 3 to 4 students attending in person weekly. Based on visual, voice, and name assessments, along with an examination of the class roster furnished with names and some photographs, the class demographic composition was estimated (see Figure 8). The in-person student demographics consisted of two White males and one Black male. The instructor of this course, Dr. Sisko, was on the tenure track. The following themes, based on class observations and weekly meetings, emerged for this course: eye contact and direction of questions, Black student engagement

matters, nonperformative speech, no red flags—proceed with caution, unchallenged status quo, DEI?—let's just get to the work of the major, and tenure-track limitations.

Figure 8

SC2: Class Composition by Percentage



Eye Contact and Direction of Questions. Dr. Sisko's primary position was at the podium and computer station, which was situated on the right of the lecturer with the visual media screen centered in the front of the small lecture room. Due to the dual modality of the class, the instructor needed to manipulate the slide presentation and monitor for questions and comments from online students. Of students attending in person, the Black male student sat directly in front of the podium and computer station. The two White males were seated on the left side of the room directly in front of the visual media screen.

Observations of eye contact revealed an imbalance in the degree to which students were visually engaged during lectures. Eye contact was tallied over a 10-minute block of time. The tally showed the Black male student who sat in front of Dr. Sisko's workstation received 23 instances of eye contact. The White male students were seated with one diagonally behind the other. Although observations indicate the White male seated in the front received the most eye

contact, because of proximity, the two were treated as a conglomerate. Tallies indicated the White male students received 47 instances of eye contact.

Although confident in observations and of eye contact tallies to corroborate the decision to treat the two White males as a conglomerate, the researcher tallied the direction toward which Dr. Sisko looked when lifting their gaze from the computer screen. Over a 10-minute block of time, 19 instances of the instructor's initial gaze toward the White males occurred compared to two times toward the Black male. In addition to eye contact and initial gaze after looking away from the computer screen, the direction of questions was tallied. A tally of four questions showed 3 of the 4 questions were directed toward the two White males, with only one question directed to the Black male.

Black Student Engagement Matters. Before class, a White male student in the class dominated conversations with Dr. Sisko. Observations showed extended before-class conversations between the instructor and the student involved topics such as classes taken, with which instructors they were taken, and potential assistantships. This interaction left little space for other students in the class to interact with the instructor before class. This, in conjunction with the observations of eye contact, initial gaze, and the direction of questions, were discussed during the weekly meeting. The next class observation yielded very different results.

After the discussion about unbalanced interactions, the researcher observed Dr. Sisko having extensive before-class conversations with the Black male in the class. Although this could be interpreted as a deliberate behavioral correction versus an organic interaction, the resulting observations were remarkable. During the remainder of the class, the Black student interacted with Dr. Sisko by way of comments and questions answered more than any previously observed class. Notably, other than the first day introductions, no comments or questions were recorded

from the Black male student until the day Dr. Sisko engaged him before class. On the day the instructor engaged the Black male student in conversation before class, in addition to three question-and-response series before class, the student engaged in six separate and distinct interactions resulting in five responses to questions and one inquiry. In one instance, the instructor directed a question toward the direction of the White males; however, the Black male was the first to answer the question. Also noted during this observation was a decrease in the disparity of the tally of eye contact. The White males received, over a 10-minute observation period, 26 instances of eye contact. The Black male received 22 instances of eye contact during the same 10-minute period.

Nonperformative Speech. Universities may engage in DEI statements; however, Dr. Sisko questioned whether it was really happening. He thought university communication around DEI "may be a great public relations stunt, but nothing really changes." Dr. Sisko commented that there is a difference between perceptions often conveyed by university DEI statements versus meaningful change.

During a weekly discussion of the issue of Black student retention in the sciences, the instructor questioned if universities care about retention. The sentiment conveyed was that universities care about money, and to secure research grants, the instructor said, "Instructors teach to get graduate students to do research. They pull up the best undergrads to continue research." Dr. Sisko conveyed it is "too great of a time drain to invest in a student who does not demonstrate ability through grades and enthusiastic interaction in the lab." One driver of this approach may be because, "with the awarding of a large grant, professors are able to buy their way out of teaching, by giving the university a certain amount of money to not teach for a semester." The instructor continued, "College rankings are likely not based on teaching but on

research and grant money." The key conveyance during this discussion was that pedagogy is not important; grants and research are the driving forces.

Dr. Sisko conveyed what seemed to be contradictions and incongruities between university DEI and actions. The instructor proffered that, if a university as a single unit versus individual instructors, deans, or departments takes decisive and measurable actions toward creating true equity and inclusion, it may precipitate challenges. Dr. Sisko felt there was a great deal of freedom in being a university professor. Mandates for training—pedagogical, bias, and otherwise—encroach on professor freedoms, which may lead to threat of or risk of reduced productivity in research, if time must be taken away to fulfill university mandates. A potential result of such impingement of freedom may force some to the private sector.

No Red Flags—Proceed With Caution. Dr. Sisko was leery of reassurances that the study was being undertaken with consideration of the sensitivity of the topic of implicit racial bias. Because of the sensitivity of the topic, instructor privacy was prioritized, and identities were not disclosed in the recording or reporting of results. The reassurance of confidentiality was not enough to provide any level of comfort with the recording of conversations. The final interview questions were requested in advance by Dr. Sisko, who wrote responses to be thoughtful and avoid in the moment sarcasm that could be misinterpreted. To ensure accuracy in recording and reporting the responses, the researcher requested to retain the handwritten responses, but the instructor denied the request due to concern the responses might be construed to demonstrate racially biased behavior or attitudes and be used against the instructor to lodge a formal complaint, potentially hinder tenure, or jeopardize employment.

In addition, a reported self-evaluation revealed Dr. Sisko was not implicitly racist so no red flags should pop up, thus Dr. Sisko concluded he should not get fired; however, if anything

were to come up as an issue regarding bias, at any time, participation in this study would serve as a form of exoneration—proof that the professor had received bias training through participation in the study. Participation in this study was added to Dr. Sisko's tenure dossier. The instructor stated the study provided good methods to be a better teacher, thus making the instructor more marketable.

Dr. Sisko reported being unbiased and operating without emotion in the field of science. Dr. Sisko explained there are ways to be unbiased in grading: (a) hide the student's name while grading and (b) have students put their name on the bottom of the last page of the exam. Dr. Sisko, however, reported not using these strategies because it is important to know the name of the student to help strengthen any potential weaknesses. It was noted that unbiased grading could still occur initially, and weaknesses noted could be associated to a name after grading.

Unchallenged Status Quo. Dr. Sisko presented a lecture on prominent figures in a specific field of STEM over a 50-year period. All scientists presented were White. The researcher presented the names and biographies of several Black scientists related to the research, one of whom was named in the top 75 distinguished contributors to the field. Dr. Sisko noted Black scientists were related to the field after the 50-year period discussed during class. The period and specific field in which the Black scientists conducted research would be discussed in the next lecture. Dr. Sisko, however, felt the Black scientists should not be included in the lecture because they were not key figures. The researcher offered that it may be necessary to look at the situation in a similar manner to the case of Hidden Figures (Shetterly, 2016), as Black scientists often were not credited for their work. Additionally, the researcher presented the idea that, considering the present study, Black students often do not see themselves reflected in the subject matter. Including a Black scientist would contribute to minimizing the sense of

isolation and disconnectedness from the subject material. Dr. Sisko indicated he would not include Black scientists in the lecture because he felt it would be done "just because they are Black." The instructor, however, felt a "nod" to diversity was given with the discussion of Italian scientists' work in the field. The instructor shared "the opportunity remains for students to write papers on whomever they would like."

DEI?— Let's Just Get to the Work of the Major. DEI statements were discussed, as it was noted a DEI statement was included with Dr. Sisko's tenure package; however, no DEI statement was included in the syllabus. The instructor indicated the syllabus in use was inherited from the department, and they were not sure of the prevalence of diversity statements. Based on the current study, it was shared that two instructors offered a diversity statement and another, together with the class, created a diversity and inclusion statement. The latter was met with intrigue but dismissed as a potential for complaints from students who might feel the exercise was a waste of their time. Dr. Sisko did concede placing a DEI statement in the syllabus might be beneficial for those who cared and ignored by those who did not. He stated, "Graduate-level students are not particularly interested in diversity and inclusion. They want to just get to the work of their major."

Tenure-Track Limitations. In a weekly meeting, the idea that a professor trying to achieve tenure is less likely to be focused on mentoring students in the form of offering lab internship opportunities was discussed. Although offering to pay a student to be a lab assistant, which would offer experiential learning and mentoring, would incur a nominal cost compared to the average grant award, the time investment would be exorbitant and a poor investment, especially for professors seeking tenure. Undergraduate students often consume a lot of time in training on lab procedures and software. The greatest return on this investment would be to have

undergraduate students return as graduate students fully versed in lab procedures and software applications; however, some students drop out, change majors, or attend graduate school at another institution.

Although the path to tenure may leave some instructors unwilling to mentor students, the importance of making personal connections and offering mentoring opportunities was recognized as valuable. Dr. Sisko shared that the department encouraged students to sign up with faculty mentors, which was a new program that had started in the current semester; therefore, no data were available on which students were taking advantage of the program. The department head visited classes and encouraged students to sign up. At the time of the study, student response had been relatively low.

Though Dr. Sisko conveyed the sentiment that mentoring relationships with students are "not incentivized" by the university, mentoring appeared to be an area in which the instructor's department was trying to do more for students. Because the offer and use of mentoring seemed mired in contradiction, Dr. Sisko suggested all students should join and attend a STEM club meeting to connect with other students with similar interest and backgrounds. To encourage connection to support through an affinity group, the instructor gave extra credit if students attended a specified number of meetings.

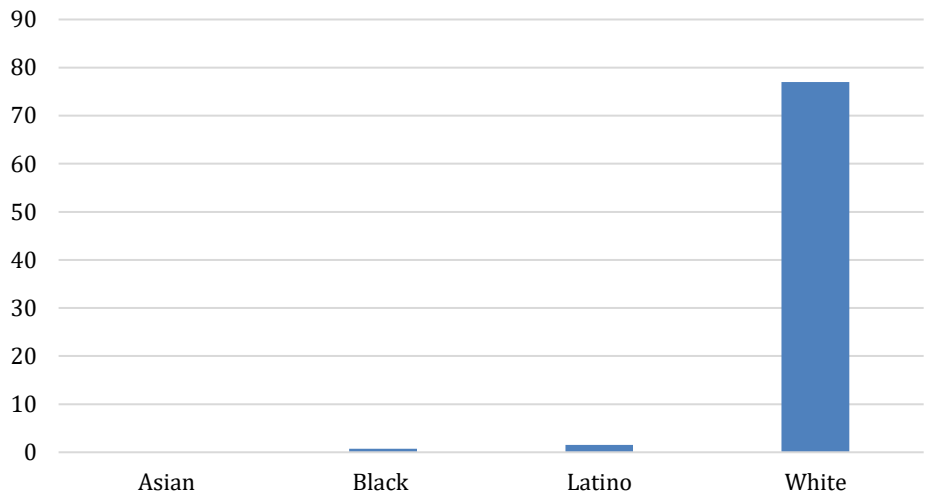
STEM Class 3

STEM Class 3 (SC3) was a graduate-level course with 13 enrolled students (see Figure 9). This uniquely structured class offered three modalities for learning. The class met twice a week with one meeting on a virtual platform where instruction was in the form of a lecture with accompanying slides. The instructor's image was always visible, although student images were not required to be visible to the class. The instructor encouraged online interaction and routinely

engaged students with questions. The second class meeting of the week encompassed both a traditional in-person lecture followed by fieldwork experiential learning. Student attendance was expected in all platforms. The instructor of this course, Dr. Spock, was a tenured instructor with over 13 years of experience instructing university courses. The following themes, based on classroom observations and weekly meetings, emerged for SC3: fostering a safe space with a diversity, equity, and inclusion statement; diversity in visual media; proximity; and multimodality captures various comfort levels.

Figure 9

SC3: Class Composition by Percentage



Note. Graduate-level STEM Class 3 course demographics, compared to STEM Class 1, reflects decreased diversity.

Fostering a Safe Space With a Diversity, Equity, and Inclusion Statement. The syllabus included a personally written DEI statement, a portion of which is included here:

> Diversity makes this course, and science in general, more productive, creative, inclusive, interesting, and engaging. I welcome you regardless of your immigration status, country

of origin and/or citizenship, race, ethnicity, religious affiliation, gender/sex, gender identity, sexual orientation, age, or dis/ability. Thank you for enriching our world, sharing your experience, and contributing to the diversity that makes our community vibrant and more creative.

On the first day of class, in addition to the written statement, Dr. Spock reiterated "diversity in the classroom was valued" and encouraged interaction and collaborative learning.

Diversity in Visual Media. During a presentation of the history of the course's subject matter, Dr. Spock used diverse images in visual media presentations. The lecture and accompanying images paid homage to the contributions of Native Americans and enslaved Africans to early work in STEM. Additional diverse images included those of a Black family camping, which offered a counternarrative to common stereotypes that tend to situate Black identity in juxtaposition with urban settings. Though not a topic of study here, the instructor also presented a representation of the important work of women in the field.

The lecture was discussed during the next weekly meeting. Dr. Spock and the researcher discussed the use of terminology relating to Africans in the United States bound by chattel slavery. The terms "slave" and "enslaved" were delineated with the distinction that the word slave indicates an identity and the word enslaved more aptly describes a condition enacted on individuals.

Proximity. In-person lectures were held at a university location off the main campus. Students sat around a large oval-shaped conference style table. Near the table was the computer station and incorporated lectern. The large visual media screen was situated near the computer station in near-perpendicular fashion with the two almost creating a 90-degree angle. The positioning of the equipment placed the instructor near the students sitting around the end of the

table near the computer station. To get a good view of the screen to explain its content, Dr. Spock stepped to the side of the computer station, which positioned him close to the table. The first in-person class observation yielded data showing the student, a Black male (BM), closest to the instructor, was responsible for 50% of the interactions during the first in-person class.

Proximity and room setup was discussed during the following weekly meeting. During the following lecture, Dr. Spock moved from the computer station to a position near the center of the table or at the end of the table opposite the computer station. There was more interaction from different students. The BM student, who dominated the conversation when Dr. Spock stayed near him, accounted for only 22% of interactions when Dr. Spock varied his positioning.

Multimodality Captures Various Comfort Levels. Three modalities allowed students multiple ways to participate. Students were 32% more interactive during online lectures compared to in-person lectures, with most questions and answers placed in the chat. Fieldwork was observed to encourage collaboration and comradery among students

Fieldwork was conducted outside the classroom, with students doing hands-on learning and exploration in a fieldwork setting. In the field setting, greater student interaction was observed. Students worked together to complete tasks. Students offered help to other students. Students showed consideration in ensuring all had opportunities to make observations and take notes. Unique findings in the field tended to be shared enthusiastically with all students. It is not possible to compare fieldwork interactions with the lectures because fieldwork often required group work with separation by space, which impeded the recording of all observations. In observations of the class interactions, only the BM student was prioritized. Interactions in the field for the BM student represented 42% of all observed field interactions, and online and in-person lecture interactions were 10% and 26% of total interactions, respectively.

Dr. Spock was interactive in the field and moved repeatedly between the groups to engage students. Extrication from the binds of the computer station and visual media screen allowed for greater interaction with students while still instructing. Test day in the field was preceded by the sharing of information, question confirmations, and encouragement by students.

Ethic of Care. Dr. Spock acknowledged mentoring "was so important to competencies and being successful" and tried to "give students a lot of different ways to do well." Noticing many Black students were not enrolled at the graduate level, Dr. Spock joined the study hoping to gain knowledge that might be used to contribute to increased retention. The instructor often reached out to students who missed class to make a personal connection and offer help if needed but noted "the bigger the class gets, the harder it is to track individuals." Although Dr. Spock expressed a willingness and "tendency" to reach out to students, Dr. Spock also expressed reservations, as some students may not want to be engaged, and thus Dr. Spock attempts to create a "disarming environment" to present as an "approachable" instructor.

Observations showed students were very interactive and supportive when on break between the in-person lecture and during field learning. By "a lot of trial and error," Dr. Spock found the format of providing a lecture followed by field experience offered

> longer stretches of instruction which is more interactive and really helps them learn because they learn from each other. My hope was to see a spin-off of some of the confidence in ones who learn by telling and communicating and from others who can do the hands-on piece.

One academic approach taken during weekly meetings was discussion of stereotype mitigation and strategies to disrupt stereotype threat (Steele & Aronson, 1995). The weekly discussion highlighted the fact that Dr. Spock engaged in stereotype mitigation prior to our

discussion. During experiential learning in the field, students took a quiz based on concepts learned in the field, which required them to go to Dr. Spock to check answers before moving on to the next field location. In one instance, a Black male student, who expressed feelings of anxiety in completing the quiz, completed an answer check-in (grading of current section), and the instructor encouraged him with, “Come on, you got this.” The sharing of the affirmation or engaging in various forms of self-affirmation, one strategy for stereotype threat mitigation, was a strategy Dr. Spock naturally employed.

STEM Class 4

STEM Class 4 (SC4) was an undergraduate course taught fully online. In addition to virtual lectures, the course also held virtual labs. Students were not required to be visible on screen, as the instructor wanted to minimize stress associated with constantly seeing one’s image in virtual platforms. Most students opted to substitute their image for the image of an avatar. Student names were listed below their chosen image. The instructor also was not visible on screen. It was very difficult to identify the racial makeup of this class. Although other courses in this study were fully or partially in person, and thus a visual assessment of racial categorization could be made in a similar manner to which implicit bias would be activated, this course only offered the opportunity to conjecture racial categorization based on students’ names and voices. Though the course modality was not the perfect fit for this study’s methodology, it presented an opportunity to investigate how the instructor combatted historic challenges faced by Black students in online courses: anonymity, isolation, and name bias (Vandyck, 2019). Following the line of inquiry presented by the course's modality still allowed the instructor to share feedback about perceptions of the researcher–instructor partnership. The instructor of this course, Dr. Kirk,

was on the tenure track. The following themes, based primarily on weekly meetings, emerged for SC4: building an online sense of community and mentoring.

Building an Online Sense of Community. While discussing challenges faced by Black students in virtual classes, Dr. Kirk felt the class structure would combat the challenges. Because Dr. Kirk did not require students to have their cameras on during virtual lectures, the concept of racial anonymity was discussed. The instructor felt there may have been a benefit of not knowing the student's racial category in that it may "actually help break down barriers" when it was time to divide students into teams. Students were divided into teams of three alphabetically. Dr. Kirk was encouraged by interactions with a BM student that the virtual platform, as it was applied for this course, was not causing harm. The instructor shared:

> I actually had a very bright, young African American man joining my lab this fall. He was in my springtime class of this course. And he's part of the [National Group][4] here on campus. He said, "Hey, you should come talk to everyone about [your research]." He was connected, but that was just one person. He told me he loved the platform. He would also come by my office hours on Zoom and just chat. That's just one data point, but I was at least encouraged that I was not harming. I did not erect walls around myself. I'm hopeful that all of that together with enthusiasm and encouragement made the difference.

In combatting isolation, Dr. Kirk committed to making the online platform work for all students by "creating a learning community." By dividing the class into teams at the start of the semester, Dr. Kirk minimized isolation often experienced in online courses. Dr. Kirk's goal was to "create a virtual classroom similar to an in-person classroom" where team members could

[4] The generalized category of "National Group" was used to mask instructor identity.

learn from each other. Teams completed exercises during breakout sessions. During the breakout sessions, Dr. Kirk visited each team to check in and answer questions.

Mentoring. Dr. Kirk was willing to mentor students who reached out. Dr. Kirk stated:

> One of the reasons I came back to academia was to be able to help educate students, but also to teach them things that are not just classroom things. Thinking about career roles and making sure that they are aligning their coursework as much as they can with what they really want to do. Usually, I have my door open. Students have popped by with a couple of questions. When they come to find me, I try to mentor as much as I can.

Dr. Kirk participated in a program where undergraduate students could join for up to 3 years to connect with faculty on research projects related to their major. Students work on teams with instructors and graduate assistants as their mentors. Dr. Kirk's research project facilitated students in gaining "resume-building skill sets." Although it is the practice of some instructors to pick the best students for lab work and assistantships, Dr. Kirk expressed not simply picking the best students who expressed interest in the program. The approach used to select students for the experiential learning program follows:

> They usually send me a resume. I look at their skills. My lab does a lot of programming. I need to find students that have that ability, but I do not exclude people who are not pure programmers. Students who maybe don't have all the skills that I require in the lab are put on projects where they can work at the boundary to let them learn more. I want to make sure students have opportunities because every now and then, in my academic and professional career, someone has held a hand out for me, so I want to help. I feel like I need to do the same.

Phase 3 – Final Interview

Phase 3 of this study was focused primarily on gathering instructors' perceptions of the study. The work completed over 6 weeks of observations and weekly meetings provided the substance discussed during the final interview. Final interviews were recorded, when permitted, and transcribed. Transcriptions were analyzed and coded using in vivo coding. From these codes, the following themes emerged to capture instructors' perceptions of the study: personalized feedback, self-reflection, instructional strategies as pedagogical tools, comfort, community of practice, and system change.

Personalized Feedback

Instructors conveyed the idea that this study's approach to bring awareness to implicit bias—using a researcher–instructor partnership—offered personalized feedback that could not be achieved at diversity workshops. Dr. Picard shared workshops do not afford someone "coming and watching you teach," the weekly observations were "really enjoyed . . . because some of the feedback were not things [the instructor] was noticing," and the feedback allowed Dr. Picard to "pay attention to things [the instructor] might otherwise not have." Dr. Spock shared the following about the weekly observation sessions and subsequent weekly meetings: "It got me to be able to drill into how I instruct, who I am as an instructor, and focus on training those strengths in a way that will allow me to be more inclusive in the classroom." Dr. Spock expressed that personalized attention was "harder to get from a day-long workshop [because] they are pretty broad brush and not very specific."

Self-Reflection

Implicit bias is the result of unconscious processes; however, mitigation of implicit bias occurs through conscious engagement. Participants of this study reported thinking more about

ways to mitigate implicit bias. Instructors expressed that the study helped them to "reorient thinking" and to "reevaluate approaches" to instruction and relationships with students. Dr. Kirk reported "trying to be more cognizant" of the manifestation and impact of implicit bias. Dr. Sisko shared the study "added to [the instructor's] knowledge about implicit bias" and resulted in [the instructor] "spend[ing] more time thinking about the topic."

Dr. Picard shared participation in this "definitely brought more attention to thinking about how implicit bias can come across in the classroom." They stated further, "I'm definitely thinking about it more." Dr. Picard used the following example of how thinking about the topic of implicit bias as influenced their classroom practices:

> If a student is being quiet, I'm trying not to make an assumption that it is because they are not prepared, but maybe it's because they are more hesitant to speak out, more afraid to speak out, because of potential reactions.

In addition to thinking more about classroom practices and because of reflection, Dr. Picard reported being more engaging and encouraging of students who may be quieter by looking for opportunities to engage students. Dr. Picard reported calling on a student who was "making eye contact" to give a response. The interaction allowed Dr. Picard to "show her it's okay, it's right." Dr. Picard also used the opportunity to "compliment" the student's engagement. Dr. Picard concluded it was "on [his] mind a little bit more" to "reach out to minority students."

Dr. Kirk also stated participation in the study, pertaining to the use of vignettes, helped Dr. Kirk to "think again . . . to keep implicit bias in check, not to make an assumption, but to actually seek out and get to know them [students]." Dr. Kirk also shared this regarding student engagement:

> It is important to me to remember that isolation occurs and so, even if I think the way

> I'm doing it right now [structuring of the course] leads to less isolation, I just keep making sure that it is in the back of my head that isolation is a problem and I need to make sure that I try to mitigate that.

Dr. Spock also credited the vignettes with helping [the instructor] to think about personal experiences with implicit bias as a teenager. Dr. Spock expressed that the sharing of the vignettes "makes it easier and disarming to examine and reexamine myself and my interactions moving forward and learn from them without being hypercritical of myself." Dr. Spock reflected on the process as being "healthy." The vignettes also helped Dr. Spock, "when interacting with students," to "think about their lived experiences and how those might be different [from my own]." Dr Kirk also referenced the vignettes in prompting him to think about high school and college when "comments would be couched as jokes and everyone would laugh" as times when "being exposed to it, even though I personally did not agree, probably [instilled] implicit bias."

Instructional strategies played a key role in contributing to reflective exercises. Dr. Spock shared current class lectures were designed "years ago" and, at the time, [the instructor] "rarely thought about" how to make "lecture content more inclusive." Dr. Spock referenced the 21 teaching strategies as a tool that "gives specific examples of very specific things to look at" and then used to "scrutinize" teaching practices. Dr. Kirk reported being more "introspective" when grading and "momentarily pausing" before grading to ensure a "clear head" to avoid "subconscious" practices that may be related to student name bias. Dr. Kirk also "liked the idea of double-blind grading" and indicated considering implementing it in future classes.

Instructional Strategies as Pedagogical Tools

Although strategies were instrumental in encouraging reflection on past and future practices, they also were useful pedagogical tools. Dr Spock noted instructors "don't get a lot of

training on how to instruct as professors." Dr. Sisko reported strategies offering "ways to be a better teacher" would be implemented. Dr. Sisko also reported planning to "make better eye contact with all students" and "ask questions of everyone."

Dr. Picard reported using the strategy of having students reflect on something positive about themselves as they prepared for an exam. This strategy was discussed in weekly meetings as a way to help mitigate stereotype threat and imposter syndrome.

Dr. Kirk found the most beneficial aspect of the partnership was "learning more about other techniques that could be used to help, so [they] have more things at [their] disposal." The sharing of resources fulfilled one of Dr. Kirk's goals for joining the research project, which was "to learn more about what could be done" to combat implicit bias.

Comfort

The theme of comfort was expressed in relation to observations of instruction and participation in weekly discussions and in conversations on race-related issues with colleagues. Dr. Spock related comfort to personalization by sharing that having "candid and authentic" discussions "that felt tailored . . . to [their] classroom and students, was very comfortable."

Dr. Picard reported feeling more comfortable participating in discussions about race with colleagues. When a colleague expressed dissatisfaction with "race theory courses," the group, of which Dr. Picard was a part, "got into a huge discussion about why you can't just ignore this." Prior to taking part in this study, Dr. Picard reported the likelihood of simply remaining silent, but because of this study, they were less "intimidated" and actually "share[d] some of [their] experiences" while participating in the study.

Dr. Sisko expressed being “fairly comfortable” with being observed and a “medium” comfort level in discussing race with the researcher but stated “more time” in study would have increased comfort levels.

Community of Practice

Instructors, during both the weekly meetings and final interview, expressed the desire to connect with other instructors who participated in this study and/or who were interested in the topic of implicit racial bias. Dr. Kirk shared:

> I don’t get many opportunities to talk about it, and I think it is important for people to do that so, I have really enjoyed being able to talk with you [the researcher] about it and make connections. I mentioned that when I read books or articles that are about race, or I listen to podcasts that are about it, it is just me by myself kind of being passive but being able to talk with someone about it has been really constructive and reinforced what I want to do . . . my best to combat these systemic issues.

Dr. Spock, in similarity, expressed:

> I think part of the reason people have a hard time, implementing certain things is because you don’t always know where to go, where you can have a good candid conversation with somebody without thinking, “I’m really going to put myself out there,” but you have to put yourself out there. But, if it is not a safe space, then I think that can hold up change because it’s easier [to do nothing]. Right now, I wouldn’t necessarily walk down the hall and talk to my colleague and say, “Hey, what do you think about something?” So having that, I think would be fantastic. I don’t know how to accomplish that.

System Change

In discussions about the desire to have colleagues with whom to discuss issues related to race, both Drs. Spock and Kirk mentioned themes of systemic change. Dr. Spock discussed not only the "need to have faculty who are willing to champion the cause" but also the importance of "identifying faculty who, to be candid, have the authority and power to help move that forward." Dr. Spock also expressed the need to "authentically, from ground up, change the culture" but that a "top-down system of support" is also needed. Dr. Spock shared:

> [After] George Floyd, we had a couple of online Zooms, having discussions, and that just fizzled out. The was a lot of discussion about internal change, and I am not faulting anyone, but I don't see anything different as a result.

Conclusion

Findings of this study were presented as themes that emerged from a researcher–instructor partnership designed to explore the topic of implicit racial bias in college STEM classrooms using classroom observations, weekly meetings, and a final interview. Over the course of 7 weeks, 6 weeks of observations and weekly meetings followed by a week of final interviews, the researcher–instructor partnership study protocols were effective in fulfilling the intent of this study—bringing awareness to implicit racial bias.

Classroom observations yielded rich data resulting in themes highlighting positive activities and strategies that mitigated the impact of implicit racial bias. Key findings in classroom observations showed instructor proximity to students encouraged increased interaction from students with the instructor. Proximity was achieved when instructors varied their position in the classroom by moving away from the computer station and taking different positions in the room. Class observations also revealed, when individually engaged in conversation by instructors, Black student engagement was markedly increased. Classroom observations showed

most instructors in this study demonstrated an ethic of care toward their students and wanted to provide a safe space where student diversity was embraced and represented in course delivery.

Weekly meetings with instructors showed instructors valued the importance of providing mentoring opportunities to encourage Black students to stay and advance in STEM majors. Although mentoring was important, university structures (e.g., the tenure process) posed challenges to expanded mentoring opportunities that might capture more Black students. Weekly meetings also revealed contradictions may exist within the university structure that limit DEI goals and render them nonperformative while holding in place systemic limitations on advancing DEI goals.

Final interviews were conducted to gather instructor perceptions of the researcher–instructor partnership. Although instructors were governed by a variety of reasons for joining the study, all hoped to learn more about implicit racial bias to improve teaching practices. Instructors expressed participation in the study and the personalized feedback they received prompted them to be more self-reflective about issues related to implicit racial bias and ways to improve teaching practices. Instructors valued resources providing instructional strategies that could be used to mitigate the impact of implicit racial bias. All instructors expressed feeling comfortable engaging in protocols such as being observed as well as discussing race and issues related to race. Instructors also expressed the desire to engage with colleagues also interested in advancing DEI goals. Instructors wanted to see more of a commitment from the university in supporting instructor professional development opportunities such as this study and communities of practice instituted to support instructor DEI goals.

CHAPTER 5 – DISCUSSION

Relevance of the Study

This study was borne by decades of research demonstrating disparate educational outcomes for Black students. The first legal case challenging disparate school discipline was in the 1970s (McCarthy et al., 2014). The Children's Defense Fund, in 1975, extensively reported on the disparate impact of school suspensions. A narrowing of suspensions began in the 1970s into the mid-1980s as the racial achievement gap fluctuated and varied by region; however, change has remained relatively stagnant over the past 40 years (Stanford Center for Educational Policy Analysis, 2022). The literature testified to the challenges Black students face in university STEM classes and K–12 prior to enrollment. The literature indicated Black students enter STEM majors at the same rates as their White counterparts but depart STEM majors at considerably higher rates (Riegle-Crumb et al., 2019). A recent meeting of the National Academy of Sciences (2022) addressed the decline in Black medical students. In the United States, the number of Black doctors, especially Black male doctors, was well below their statistical representation in society. The medical profession is in desperate need of more Black doctors, as well as doctors trained in implicit racial bias, to counter disparate medical delivery to Black patients. In addition, more highly trained STEM professionals are needed to fill a high volume of vacant STEM positions. Based on these existing realities, steeped in unrealized potential and what appears to be the significant impact of race, the focus of this study was not on reiterating the problems but

rather on proposing a practical strategy to bring awareness to and mitigate implicit racial bias in STEM classrooms.

After following the path created by the literature and coming to an understanding of the depth and breadth of the campaign through the centuries that created and sustained inequity, and considering the assessment of Feagin (2020), "it typically takes many hours of instruction and dialogue over many months to get . . . adults to even begin to think deeply and critically about the array of racially stereotyped images, beliefs, emotions, and interpretations" (p. 246). Additionally, Feagin (2020) asserted "changing . . . centuries-old framing will require much effort and innovation, and major new educational strategies" (p. 246); thus, a personalized, relationship-based educational model was designed for this study.

Through the vehicle of a partnership with university instructors, findings of this study emerged to reveal multifaceted themes. These multifaceted themes led to various strategies to bring awareness to and mitigate implicit racial bias, not only in course delivery but also in student interactions. Different strategies were selected based on class needs as dictated by course modality, instructor characteristics, and student characteristics. The findings showed universities, researchers, and instructors can use multiple strategies to bring awareness to and mitigate implicit racial bias through a personalized, collaborative, and respectful partnership.

Research Questions and Results

RQ1: What Factors Contribute to Instructor Participation in a Researcher-Instructor Partnership to Explore Implicit Racial Bias in Course Delivery and Instructor-Student Interactions

Instructors reported various reasons for joining the study during the weekly meetings and final interview. The common reason for joining the study was to engage in self-improvement

through the information that would be shared throughout the course of the study. Secondary reasons for joining the study included gaining insight into recruiting and retaining Black graduate students in STEM and fulfilling personal DEI learning goals. Last but not least, instructors understood the sensitivity of the topic and extended benevolence to the graduate student completing the study.

RQ2: How Does Researcher Feedback Influence Instructor–Student Interactions and Course Delivery?

The study benefited from exploring multiple modalities of instruction and varying class sizes. Within each, the challenges to engagement were discussed and strategies for engagement were explored. As one instructor noted, engagement is easier in smaller classes because challenges are presented when class size increases. Observations of this study revealed, even in large classes, when an instructor moves from behind the lectern, walks among the aisles, makes eye contact with students, and asks questions in proximity, students of all racial backgrounds were more encouraged to respond; however, Black students overwhelmingly preferred to interact when in proximity to the instructor. Notably the instructor became more aware when isolated at the front of the classroom due to needing to reach the computer. With the ongoing practice of moving about the lecture hall, observations evidenced that students anticipated the instructor's movement to the side of the room on which they were located and engaged in questions and comments once the instructor traversed their side of the room.

Additionally, engagement from Black students in a large lecture class was achieved when the instructor presented material pertaining to issues minoritized populations often experience. Presenting material relevant to experiences of minoritized students, who often attend with

aspirations of giving back to their communities, in turn presents the instructor as a potential ally and partner in their educational journey.

As the literature suggested, Black students and even Black professionals express being ignored in predominantly White settings (McGee, 2020). They often do not receive eye contact and questions and therefore no opportunity for interaction and relationship building. Those who have established rapport with instructors and supervisors are those likely to be considered for assistantships, special projects, and promotions. Even in a small setting with just three students present, one White male student dominated before-class conversations with the instructor and received much of the instructor's eye contact and questions during the lecture. As demonstrated in this study, when the data were brought to the attention of the instructor, who then purposed to speak with the Black male student, that student was motivated to engage with questions and comments, which likely occurred because he felt seen.

RQ3: What Are Instructors' Perceptions of the Researcher–Instructor Partnership?

Instructors participated in the study for various reasons. One thought it was a beneficial training method to reach personal DEI training goals. Others wanted to learn more based on past experiences or observations of racial inequity in both the classroom and society. During the process, some instructors shared moments when they realized they had fallen victim to racial implicit bias and expressed appreciation for a study offering a personalized approach to examining an often emotionally charged and sensitive topic.

Overwhelmingly, in Phase 2, instructors rated the partnership a positive experience. Instructors reported feeling comfortable and respected in discussions. They also expressed great value in receiving personalized attention, the benefits of which could not be achieved by a one-and-done workshop. The partnership was also valued for resources offering strategic approaches

to mitigate the impact of implicit bias effectively. In addition, the partnership was touted as a valuable resume-building, antibias, and DEI training tool.

Relating Results to Theory

Symbolic interactionism is based on three basic principles. The first two principles assert that human beings create meanings and apply those meanings to objects, which include human beings, and that meanings are developed via social interactions. The final principle posits the derived "meanings are handled in an, and modified through, an interpretive process used by the person in dealing with the things he encounters" (Mead, 1934, p. 2). In terms of implicit racial bias, the process by which implicit racial bias is instilled in a person occurs via the first two principles. The third principle of symbolic interactionism indicates the meanings an individual creates can be modified. The interpretive process leading to modification is a key component of this study. The researcher–instructor partnership relies on the interpretive process. After observations were conducted, I applied meaning or themes to the observed interactions. During the weekly meeting, observations were shared with the instructor, who then processed the information; incorporated the information into their knowledge base; and then adjusted, adapted, or replaced previous information. The partnership created the opportunity to engage in a new interpretive process.

I will apply Engeström's (2001) CHAT to the university as an activity system. My application is limited to universities in the United States. The university is a collective of many activity systems. Universities have many colleges, and, within each college, there are multiple departments. According to CHAT, the university is an artifact-mediated activity system. The university is constantly producing artifacts, such as research findings, journal articles, and research-based product development. The university also is a community of individuals with

multiple points of view, traditions, interests, and histories; however, the institution of the university has layers of history embodied in rules, conventions, and ways of being. Universities once only educated wealthy, White men to the exclusion of all women, poor White men, and all Black men. Changes and transformations to the university over time represent the third premise of CHAT. The fourth premise asserts contradictions occur within systems, sometimes out of discontentment because the system is no longer meeting its members' needs. Contradictions in the activity system leads to changes when "some individual participants begin to question and deviate from its established norms" (Engeström, 2001, p. 137). The final principle of CHAT asserts activity systems can undergo transformations because of contradictions. I propose participants of this study, and I recognize there are contradictions within the activity system: the university. Findings of the present study revealed the university experiences contradictions, as evidenced in Black student attrition from STEM, and instructors and researchers looking for transformation within the system.

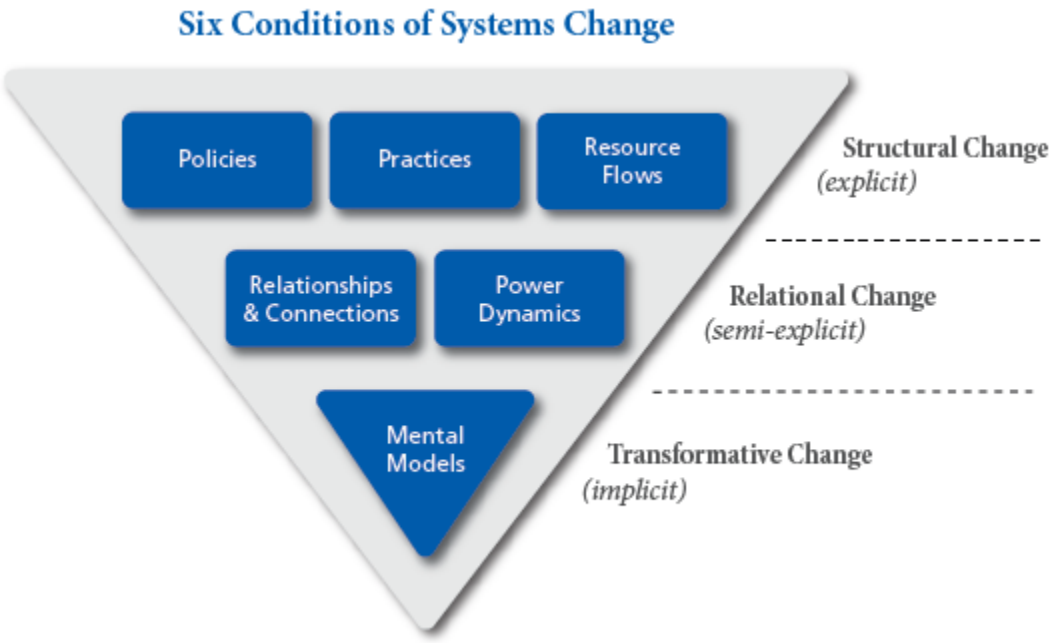
CHAT provides a framework in which to position and make sense of how changes occur in university activity systems. The question to be answered is whether the university realizes that the practices in which it engages are nonperformative in retaining, supporting, and promoting Black students in and through STEM majors. I use the following illustration to exemplify my point: "A fish is swimming along one day when another fish comes up and says, 'Hey, how's the water?' The first fish stares back blankly at the second fish and then says, 'What's water?'"

Although CHAT provides a framework for understanding, I felt it lacked a model for change. Hopefully the present study will color the water so universities see more clearly that the problem of Black student attrition from the sciences is a problem that can be changed by changing the conditions holding the problem in place. First, this study shows instructors are

interested in how to reduce attrition and joined a study to help them explore how implicit racial bias may play a role. Second, symbolically louder than the voice of the four instructors who participated in this study are the "voices" of the 249 who did not respond. The reason for the lack of response or lack of interest should be explored as potentially contributing to holding the problem in place. An examination of Kania et al. (2018), a systems change model by which universities can begin to stir the water of their activity system to facilitate change (see Figure 10), is beneficial to mention here and should be considered in future iterations of this study.

Figure 10

Systems Change Model



I will relate the findings of this study to the six conditions of systems change and the three levels of change (see Figure 8). Structural changes to consider include those in relation to tenure policies, practices, and how financial resources support policies and practice to bring about desired changes. Many tenure policies and practices are directed to the benefit of the

university. I propose changes that include more resources aimed at training centered on student success, including implicit bias training. Tenure policies should be transformed to include mentoring in the community service requirements. At the relational change level, the key component is considering how communication, connections, interaction, and supports occur, "especially among those with differing histories and viewpoints" (Kania, 2018, p. 4). Although 19 surveys across several departments were returned, multiple departments within programs had no surveys returned. The university must ensure power imbalances do not derail systemic and individual efforts to improve student outcomes due to differing histories, viewpoints, and departmental cultures. Finally, at the transformative level, the implicit, Kania et al. (2018) emphasized "unless [systems] can learn to work at this third level, changes in the other two levels will, at best, be temporary or incomplete" (p. 8). Findings of this study validated this statement. Instructors looked back at town halls and gatherings for discussions on systemic inequity that gave space for a police officer to extinguish the life of a Black man on a public street and concluded nothing came of those university efforts. This again brings clarity to not only the need for broader initiatives and new ways of addressing old problems, at the implicit or transformative level, but also the need to recognize power dynamics historically reinforce and maintain structures and practices working for those in positions of power without giving fair consideration to those who are impacted adversely (Black students losing opportunities to fulfill STEM goals) by "the way things have always been."

Cultural Humility

During the process of analyzing the study results, the concept of cultural humility (Tervalon & Murray-Garcia, 1998) played an important role in the theoretical framework of this study. Although the theoretical framework presented in this study conceptualized societal

influences on the human psyche and how institutions navigate influences of their context, the concept of cultural humility in conjunction with the study findings may motivate institutional decision makers toward use of a systems change model as presented previously. It seems clear that I, the researcher, and the instructors who participated in this study, engaged in a process of cultural humility as we participated in weeks of observations, followed by respectful and reflective discussions and interviews. The concept of cultural humility offers a working model for the continued evolution of individuals within systems when engaged in study protocols and once participation in the study concludes.

Cultural humility is represented in a commitment to lifelong learning in which the process of self-reflection and critique allows one to balance their own experiences to remain open to the lived experiences of others (Tervalon & Murray-Garcia, 1998). Cultural humility requires an interrogation of beliefs and values and the contexts in which they are developed. Engaging in the process that leads to cultural humility guards from falling victim to cultural encapsulation in which individuals center their lived experiences and are unable or unwilling to accommodate the humanity of others who have different lived experiences from their own (Haynes-Mendez & Engelsmeier, 2020). By engaging in the process, we, as educators, then can recognize power imbalances and become more open to student-centered approaches to interaction that promote learning, connectedness, and persistence in STEM.

Instructors who participated in this study embodied the idea of cultural humility in their willingness to be observed to gain feedback. Each instructor respectfully listened to suggestions I offered and were willing to implement or consider implementation or adaptations to benefit students in their classes. Also demonstrated was openness to discussing race and racialized issues by considering those issues as presented from the perspective of other researchers, activists, and

myself, a Black female researcher. The openness also extended to time taken to interrogate histories and influences, which is the key to exposing potential implicit racial bias.

Implications

Implications of the findings of this study are important for practice, policy, and subsequent research.

Implications for Students

Colleges and universities espouse commitments to diversity, equity, and inclusion in recruitment brochures and website propaganda. Higher education institutions even go as far as to create, encourage, and fund affinity groups for Black students. Affinity groups rightfully present a safe place for Black students to decompress and engage absent the racialized gaze (Yancy, 2016). Funding for these spaces is used to purchase material resources for those in need, food, and special gatherings, and the integrated spaces of the university remain in need of sustained and measurable interventions.

Although these efforts are vital components in the execution of diversity, equity, and inclusion ideals, they play only a small part in the actual achievement of DEI goals. Even though institutions present themselves as bearers of a standard that eludes their grasp, students continue to struggle with stigmatized existences fraught with microaggressions and presumed inferiority. The problems Black students encounter in the classroom, at the instructor level, are driven by instructor attitudes, perceptions, experiences, and beliefs, a mosaic kneaded together intricately and collectively to form the basis of implicit racial bias. It is at this level where students are impacted negatively; however, in many instances, DEI initiatives for instructors seem to be no more than a suggestion they may or may not choose to exercise. This may evidence a disconnection from institutional objectives or a lack of fluidity of institutional mores flowing

from institutional leaders to those who impact the very livelihood of the institution: instructors and students.

At the end of a class where one instructor in this study presented the class's DEI statement, many students clapped, but, notably, a White male student raised arms into the air as if stretching and yawned at the end of the statement's reading. Maybe he was tired that day or maybe he was expressing his disinterest in the topic symbolically. I couple that moment with the same instructor's statement of apology for including sickle cell disease in a lecture with accompanying articles on current research for a brief analysis. Interestingly, the instructor in this case also shared other extras to help students become more successful such as Ted Talks and Honor Code adherence talks, to name a couple, but did not apologize for those also well-intended diversions. The instructor is not to be faulted, but a university environment where the complaints of culture dominant students—White students who do not deem it necessary to discuss diverse and nonmainstream issues—seemingly hold instructors hostage. Another instructor was concerned students would complain about topics pertaining primarily to Black and other minoritized groups as well as DEI statements. To fall prey to the discomfort of the members of the majority, by not engaging in minority-specific topics in the sciences, simply perpetuates marginalization. Too often, medical and environmental issues pertaining to Black populations receive less research funding and attention. During class observations, I learned about the deficit in Black individuals on the bone marrow registry. Black bone marrow donors offer the highest chance of sickle cell patients finding a match. Information of this nature is vital in a college or university classroom as younger individuals are the ideal bone marrow donors.

If academia pulls these topics from the margins, as the one instructor chose to do, practical things begin to happen. More people hear about the issues. Exposure to the issues in

university STEM classes increases the chances of students taking interest in the topic, which could influence future research interests. Universities and instructors interested in expanding DEI goals must not allow themselves to be held hostage by the loud intolerance of the few in the majority. Like so many issues in history—emancipation, suffrage, voting rights, school integration, civil rights, marriage equality—when the brave take a stand, change happens, and others follow.

Implications for Institutions

Diversity, when only a physical description of difference, or a description of variation among a heterogeneous group, leaves the door open for the othering of individuals by the dominant members of the group. Inclusion is the process of acknowledging difference and creating space for the humanity of those individuals, recognizing the dominant narrative must become more inclusive of diverse experiences and perspectives. As a community and the community's extension, society, equity cannot be reached without inclusion. Topics addressing issues pertaining to the minoritized should not be attended to in the last minutes of class, placed in a syllabus for those who are interested, or its inclusion apologized for to avoid displeasuring the privileged majority. Topics related to diversity, equity, and inclusion should not be boxed into specialized, set aside timeframes, or otherwise marginalized within the curriculum, but should be treated as commonplace, an expected normal. Diversity then moves away from a physical description toward an accepted, anticipated, and expected way of being.

University contradictions to DEI goals may also lie in the process of tenure. Findings of this study showed, when engaged by instructors, Black students reciprocate enthusiastically. Findings also showed instructors understand the value of mentoring students. Unfortunately, the university as a system does not support the time it takes for instructors to mentor students

because of conflicting goals. The desire of professors to make tenure often leads them to recruit the top and most experienced students for research opportunities to reduce time investment while pursuing tenure. At top research institutions, the greatest value is placed on grant-funded research. The hierarchy inadvertently disadvantages those who would benefit from mentoring experiences and may unfairly advantage already privileged students. Students from underresourced urban and rural schools often lacked lab and hands-on exposure in high school STEM classes due to lack of funding; thus, students from well-resourced backgrounds are positioned to make advances, and other students miss out on valuable research experience. Unless the process of selection to internships and mentorships at the undergraduate level is engaged in more equitably, the university is inadvertently responsible for perpetuating cycles of inequity, thus contributing to the systemic racism limiting Black students from advancing with lab and mentoring experience vital to fostering the science mindset needed to move into advanced scientific study successfully.

Universities may need to consider institutional changes to create more equitable opportunities for students to engage in research. As one instructor in this study indicated, students with varying abilities are welcomed into research opportunities. Students are placed according to their ability as they are mentored by the instructor and other students. Universities may consider ways to incorporate student mentoring into professor community service responsibilities. When expectations are tied to evaluation, a shift in student engagement and retention may be realized.

Implications for Instructors

Tenure ambitions may cause instructors to not focus on the student and student success, not because they do not care about student success but because they must focus on research,

publications, and grant dollars to have the best chance of securing tenure. If universities are truly concerned about the success of all students, a culture or atmosphere of student success should be prioritized with actionable goals that encourage instructors to operate with a student-centered focus. When instructors embrace the idea that "teaching is not valued for tenure," as shared by one survey respondent, or that building relationships with students "is not incentivized," one can assume students may not be receiving the best instruction and support. Subject matter experts cannot be assumed to be competent conveyors of instructional materials with a student-centered approach that would encourage persistence in STEM. Pedagogical training is not required for instructors; however, whether trained or not, student success in introductory courses is intertwined with instructors' ability to convey material, convey diversity in the subject matter, and understand how to have meaningful interactions with students. As findings of this study showed, Black students appreciate the representation of culturally diverse issues within the context of the course subject matter, and Black students are encouraged by one-to-one interactions from faculty members. Universities as systems have a responsibility and the authority to create an environment where student success is as important as grant dollars.

Additionally, universities should support instructors' desires to learn more about the impact of race and implicit racial bias in the classroom. Instructors in this study wanted to engage with other faculty members with similar DEI interests to create a community that could provide resources and feedback. At the time of this research, some instructors reported not having fellow faculty members with whom they felt comfortable discussing race. It is important that university offices responsible for faculty support ensure faculty have safe spaces to navigate professional development specific to race.

Taking into consideration instructor comments regarding lack of faculty peer support around DEI and the idea that faculty may have avoided this study due to fear of being accused of racial bias because of instructional observations, universities should ensure necessary faculty supports and education are instituted, administered through trained and knowledgeable faculty, and readily accessible. To change university culture regarding DEI, it may be necessary to incorporate initiatives into faculty evaluations. As O'Meara and Templeton (2022) suggested, faculty should be recognized for their contributions to university DEI initiatives. In addition to recognizing faculty who are doing extra work to create equitable and inclusive learning environments, it may be necessary to make DEI expectations more specific to encourage more faculty involvement in advancing university DEI initiatives.

Policy Implications

Findings of this study are relevant and timely as districts across the United States have experienced recruitment and retention challenges amid efforts to improve student outcomes. One instructor stated this study provided methods to be a better teacher, and the specific implicit racial bias training rendered the instructor more marketable. The idea that implicit bias training improves marketability is not novel nor should it be taken lightly. As mentioned previously, teacher racial biases have been shown to contribute to disparate discipline, lower student expectations, and majority-biased curricula that contribute to the achievement gap (Pearman et al., 2019; Will, 2021). To combat the consequences of teacher racial bias, Rice-Harris of the American Association of School Personnel Administrators, reported school districts are screening for racial bias during teacher job interviews. In addition to selecting candidates who demonstrate "cultural competency" (Will, 2021, para. 6), rejecting candidates demonstrating "a deficit mindset towards students of color" (para. 20), and in alignment with this study, districts

screen for candidates who demonstrate the ability to "address the social and emotional needs of students to foster increased student-engagement and learning" (para. 12). Hiring practices emphasizing equity and diversity have also been shown to benefit teacher retention goals as data show most "teachers of color who leave the profession do so in part because they've experienced microaggressions and racist stereotypes from their colleagues" (Will, 2020, para. 26). Developments in hiring practices necessitate the institution of implicit racial bias training in teacher education programs, professional development, and continuing education courses.

Juxtaposed to DEI hiring practices are feelings of sensitivity, fear, guilt, embarrassment, and likely an array of other human emotions surrounding and influencing how people process and address race and race relations, which have fueled the political climate to the extent that White politicians are dictating how race should be approached and discussed in schools and society at large. State legislatures around the country have instituted bans on making someone feel guilty about race. Some have also banned discussing U.S. history in a negative way in school lessons, in essence censuring authentic and truthful human discourse. Can we still call this education, or should we call it indoctrination? Education has its foundation in truth and facts, and indoctrination instills what someone would have you believe based on their determined criteria. It will be interesting to see how teachers discuss centuries of chattel enslavement in the United States in a positive manner. Maybe they will return to textbooks depicting the "happy slave." The new edicts do not serve the true needs of society, which are continued engagement in reconciliation, but further marginalize minoritized populations by ignoring unpleasant histories that influenced implicit racial bias, which in turn shaped and continue to shape the experiences of Black people in the United States. From this, I would like to pivot to focus on the results of this study that showed individuals are looking for avenues to discuss race and racial biases, the

disparities manifested as a result, and ways to minimize and eliminate those disparities. The feedback from instructors who participated in this study demonstrated the topic of race and implicit racial bias can be approached in a thoughtful and respectful manner, resulting in learning about how one may be impacted by implicit racial bias, how historic ways of being and learning may influence teaching practices, practical tools to self-interrogate, and how to broaden the circle of inclusion in all classrooms.

Instead of instituting policies to shut down dialogue because of fear, this study's protocol represents a model of the iterative process Blumer (1969) discussed, the symbolic interaction moving one toward collaborative learning, new meanings, and mutual understandings that can move individuals toward the path of cultural humility.

Limitations

Survey Limitations

The survey was designed not only as a tool to recruit instructors to Phase 2 but also as a tool to gather quantitative data. It was anticipated most survey respondents would choose not to move to Phase 2 because of the sensitive nature of an inquiry into implicit racial bias. With the promise of survey response anonymity, the hope was to collect enough survey data for both quantitative and qualitative analysis. Although it is anticipated that a self-administered web survey will generally have a return rate of 30% (Coughlan et al., 2008), the current survey, impacted by nonresponse bias, received an even lower response rate of 7% (n = 19), rendering any statistically analysis beyond descriptive statistics invalid. Thus, no inferences could be made from the survey data.

Thirteen or 68% of the respondents indicated they were somewhat interested in the study but needed more information. Additional information was provided via email. Notably, the last

section of the survey allowed space for respondents to ask specific questions they may have had about the study and to provide an email address to which a response could be sent. Although 68% requested more information, none offered any questions or indications of the required clarification needed to opt into Phase 2 of the study when the survey was completed. Though a response with additional information was communicated with the offer for further dialogue, only 2 of the 13 respondents continued to Phase 2. The remaining 11 offered no further communication. Thus, the study was limited in its ability to gather information about the lack of respondent commitment to Phase 2 after expressing interest in the possibility of continuation after receiving more information.

Satisficing

Survey responses were likely limited by satisficing, which occurs when a great deal of effort is not put into answering the survey questions. Satisficing, influenced by difficulty of the survey and the ability and motivation to complete the survey, can result in respondents selecting what would be considered "a reasonable answer without referring to an internal psychological cues specifically relevant to attitude, belief, or event of interest" (Krosnick et al., 1996, p. 32). Satisficing may explain the lack of commentary offered in the final open-ended questions.

Self-Selection Bias

Survey responses, Phase 2 weekly meetings, and Phase 3 interviews may have been influenced by various biases. Volunteer bias, also known as self-selection bias, may have impacted the study. The study was conducted with instructors who volunteered to join. It is possible these instructors were generally more likely and willing to make changes and comfortable with discussions regarding implicit racial bias. It can be assumed instructors who are

uncomfortable with the topic, and thus could benefit from this study, opted not to join the study due to potential discomfort or denial of implicit racial bias as an issue they needed to address.

Self-Report and Social Desirability Bias

Self-report and social desirability bias were potential limitations in the reported data (Mitchell & Jolley, 2012). Attempts were made to minimize these threats by creating a survey that could be returned anonymously. In addition to weekly discussions and interview sessions, observational data were gathered to possibly counter either bias.

Case Study Limitations

Although every effort was made to develop a detailed study protocol for replication of the study, a lack of randomization limits the ability to generalize results of the study to the wider population of postsecondary institutions. Researcher bias was also a limitation.

Future Directions

Future directions presented in the following sections represent opportunities to expand the study using additional methodologies to gather additional data.

Toward Generalization

According to Yin (2018), case study research can be conducted with the goal of generalization. Yin (2018) suggested case studies can be generalizable to theories, also known as analytical generalization, which is achieved by "either corroborating, modifying, rejecting, or otherwise advancing theoretical concepts" (p. 38) used in the design of the case study. Replication of this study should be conducted using single case study or multiple case study design. A multiple case design, which Yin suggested, will provide great support for theoretical replication and thus analytical generalization; the first case should be studied and reported on,

followed by subsequent cases and results compared. Yin suggested, when theories are straightforward, two or three study replications are sufficient for analytical generalization.

Multiple theories were used to frame this study and suggest pathways to transformation. Numerous pathways remain to advance research in mitigating the impact of implicit racial bias at an activity system level (the multiple systems of the university) and at the individual level.

Student Perspectives

Observations of instructors and their classes resulted in the generation of several themes. Future iterations of this study would benefit from student focus groups that might offer the opportunity to engage students on events that cohered into themes. Student perspectives on the effectiveness of instructor practices as evidenced in the themes related to feelings of belonging and connectedness, proximity in interactions, and impact of affinity bias would serve to expand applications of this study. Observations showed Black students were more likely to interact with the instructor when they were near the instructor and when the instructor engaged with them in one-to-one conversations. Investigating student perspectives regarding the theme of proximity would yield information of value to benefit instructor preparation and course delivery. Findings of this study offered the counter narrative to the experiences of the Black student represented in the literature as feeling ignored and experiencing isolation. Results indicated Black students welcome engagement and may be more apt to participate when engaged by the instructor.

Study Protocol Application Expansion

The literature has evidenced historic gaps in disparate application of discipline to Black students versus their White counterparts. The disparity begins at the earliest points of entry into the education system before a teacher can even point to a history or track record of inappropriate behavior. An eye gaze study showed Black preschool students were watched more closely with

the expectation of bad behavior (Gilliam et al., 2016). With historicity of behavior controlled for, it is more than reasonable to explore teacher factors in disparate treatment of Black children in the PK–12 setting. Studies also have shown teacher racial bias impacts student academic achievement (Education Commission of the States, 2012; McKown & Weinstein, 2008; Rubie-Davies et al., 2006; Tenebaum & Ruck, 2007; van den Bergh et al., 2010). Improving outcomes for Black students starts with helping educators understand why and how their practices and implicit beliefs contribute to disparate outcomes. Applications of this study in PK–12 settings may prove beneficial in helping teachers become aware of unconscious practices and supply them with tools for self-interrogation and strategies to mitigate the impacts of implicit racial bias.

Additionally, the application of study protocols would likely benefit teacher training programs during student teaching and should be incorporated into the evaluation process. An accompanying course in implicit bias education should be incorporated into all teacher training programs and administrator certification programs. Awareness is the first step toward mitigating the impact of an unconscious process. With numerous studies showing the impact of educator racial bias and the potential for measurable improvements in student outcomes, implicit racial bias training is crucial to producing educators prepared to teach in culturally and racially diverse classrooms.

Study of Non-Teacher Factors

Observing student work groups in the classroom was not a planned activity of this study; however, it represents the ideal work of a partnership. The instructor was curious about how group dynamics were materializing as group work was designed with the idea that groups would be a support and resource for students. As an observer in the classroom, I was positioned to make observations and provide feedback. In this case, observations yielded data relevant to the study

of affinity bias among students and its impact on Black students' sense of belonging in STEM classes. As a result of the feedback, the instructor made changes to group procedures, which proved effective in manipulating group dynamics. In a large lecture class, a partnership of this nature revealed additional branches for future research on creating more inclusive classrooms.

Instructor Communities of Practice

Instructors communicated that university culture plays a key role in bringing about change and felt more support is needed from the university in helping instructors navigate topics (e.g., implicit racial bias) to benefit student outcomes. Questions were posed on whether the university truly cared about its students or was guilty of nonperformative speech acts. Instructors expressed the desire to have a network of colleagues who could offer support and feedback as future instructional strategies to attain DEI goals are considered.

Future research should consider ways to connect and support instructors as members of communities of practice, defined as a group of people who share a common concern or interest in a topic and come together to fulfill individual and group goals by sharing best practices and creating new knowledge to enhance professional practice (Lave & Wenger, 1991).

Conclusion

Unaddressed, unexamined, or unchallenged implicit bias has been shown to impact student outcomes negatively. Very specific and person-centered interventions are needed to address bias operating in the unconscious. As this study's results demonstrated, personalized work is needed and appreciated. Instructors had individual reasons for joining the study, some of which were influenced by past experiences that brought awareness to racial disparities at various levels of society and in education as well as current needs and future aims. What speaks louder than the four instructors who joined the study are the 249 who did not respond to the survey.

Although this research focused on the mitigation of implicit racial bias in higher education STEM classrooms, applications of this work can be extended throughout K–20 education. I recall attending a meeting of minority parents of students who attended a private PreK-12 PWI. One parent shared an incident that occurred when the teacher asked elementary-age students to join hands and walk in pairs down the hallway. A White student looked at her Black partner and said, "I can't hold her hand. She's Black." The Black student responded by indicating the need to follow the teacher's instruction with, "You will never have to worry about holding my hand again." I, in turn, shared the experience of my daughter, who informed her seventh-grade history teacher that an assignment that asked the class to write an essay as they imagined themselves on a ship during the Age of Exploration was racially insensitive. A 45-minute discussion/debate ensued with my daughter and another Black student having to defend their position. The teacher told my daughter the assignment should not be an issue for her because she is not African. Eventually, the White students in the class, who had been observing the exchange and had no inkling of the significant implications of the challenge and ensuing debate, prodded my daughter and her Black classmate to, "Just let it go." The exchanges discussed bring into eminence the questions McGee and Stovall (2015) posted:

> Should we ask historically marginalized students to become grittier and more resilient? Or should our fight be directed toward achieving greater racial justice so that black students do not have to compromise their mental and physical well-being? (p. 502)

The onus should not be on Black students to dig deep for more grit and resilience to overcome negative racial attitudes—explicit or implicit. In contrast, institutions should dig deeper and wider to provide and require instructors to engage in implicit racial bias training that will lead to improved outcomes for all.

Final Thoughts

I completed much of the work of this dissertation during the worldwide COVID-19 pandemic. The pandemic brought much of the world to a screeching halt with many resigned to the confines of their homes. Like fellow Americans and much of the world, with everyday business and distractions minimized, I watched on television, over and over again, the murder of George Floyd on the dirty asphalt of a Minneapolis street . . . the senseless murder of Ahmaud Arbery, cornered as he jogged down a quiet road in Glynn County, Georgia and then shot to death . . . the account of the murder of Breonna Taylor . . . and on a bright note, the survival of Christian Cooper, after the racially inflamed 911 call laden with historic tropes of the dangerous African American man threatening the White damsel in distress. In each of these instances, I thought of the work I was undertaking and its relevance. In each case and so many others unnamed here, I wondered about the role of implicit racial bias. To those who kept me motivated to continue writing, I dedicate this work to you.

Even though children in K-12 education and college students are not being shot to death by police in the classroom, they are being body slammed, and precious little children are being handcuffed and zip tied. In accordance with Dr. Benita Love, I agree that Black students are being spirit murdered at all levels of education. I have provided multiple examples from my personal experience. As researchers, we must look to the literature to build our case for inquiry. Unfortunately, as I approached the completion of this work, I did not have to look much further than my daughter's predominantly White private school, once again, to see that this work must continue, as I was much angered and disappointed to receive a call from my daughter that she and her classmates, who are all White, were assigned a reading depicting enslaved Africans in the United States as "simple-minded buffoons." When she brought it to the attention of her

teacher, the teacher said she would have to read the text, as she had not read it prior to its assignment. Did the teacher not read the text because it had always been assigned by the history department? It is disappointing to think a teacher did not read a text before assigning it to the class and may be responsible for depositing information that would likely contribute to or reinforce implicit racial bias in many students in the class. Angering was the fact that when approached by my daughter, the teacher told her she (the Black student) could bring in some sources to share with the class. The burden of educating a PhD-credentialed teacher and her class about race is not the responsibility of a Black high school student. It is traumatic to have to sit in a class where people who look like you are being belittled as lacking intelligence. It is traumatic to have to go to a teacher to enlighten her to the inaccuracies of the text she assigned. It is traumatic to have her then tell you to educate the class with your own resources. Black children are often not afforded the luxury of being carefree students. Too often they are burdened with being the defenders of the race or sitting in quiet humiliation. Sadly, this was not the first time one of my daughters experienced being tasked to educate PhD-credentialed teachers about issues of racial disparity and injustice, nor was it the first time one of my daughters had to bring to the attention of the teacher that a text contained inaccurate historical content disparaging Black Americans. The role of implicit racial bias allows individuals to overlook the use of stereotypical tropes, such as the unintelligent Black being, and fall prey to the idea that the Black female child, often perceived to be older and expected to carry more burden and responsibility than her White counterparts, should educate the class to counter racist writings posing as education, because they are commonplace and comfortably rooted in our psyche until exposed, challenged, and extricated.

My hope for this work is that, as a society, we would try something new to eradicate, simply stated, the old and tired problem of racism—explicit and implicit. Throughout the process of completing this work, I was encouraged by the words of author Arundhati Roy (2020):

> Historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different. It is a portal, a gateway between one world and the next. We can choose to walk through it, dragging the carcasses of our prejudice and hatred. . . . Or we can walk through lightly, with little luggage, ready to imagine another world. (p. 191)

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APPENDIX A

Introductory Email Sent to Department Chairs

Greetings (Name of Department Chair)

I hope this email finds you well. My name is Jacqueline Wilson, and I am a PhD doctoral student in the Curriculum, Culture, and Change Program at VCU's School of Education. My dissertation research focuses on the potential impact of implicit bias in the attrition of Black students from STEM majors. I have designed a mixed methods study that has been approved by VCU's IRB (IRB HM0021215). Phase1 of the study consists of a survey to be administered to STEM professors and instructors. To assist in my data collection, I was wondering if you will consider forwarding the invitation email, which contains the survey link, to the instructors and professors in your department (please see below). If you would prefer, I can contact them directly.
I would be happy to share more detailed information. Please let me know if I can provide you with anything additional.

Best, Jacqueline Wilson

Greetings STEM Instructor,

My name is Jacqueline Wilson, and I am a doctoral student at VCU's School of Education. I am conducting a dissertation study on implicit bias in the STEM classroom. As an instructor of a STEM class, your input is valuable to me as I continue to explore this topic. A mixed methods design is being utilized for this study. You are invited to take part in the first phase of the research study which is the survey. The survey will take about 5 to 10 minutes to complete. At the end of the survey, you will be asked whether you are interested in participating in the second phase of this research which will include classroom observations, observation review sessions, and a final interview. If interested, you will then be asked to provide your contact information so I can follow-up with you.

A study information and consent form is attached. Please feel free to contact me if you have any questions about this study. Please use the link below to complete the survey. By completing this survey, you are consenting to participating in the survey phase of this study.

Link

The survey will close after 14 days.

Introductory Email Sent Directly to Instructors

SUBJECT LINE: STEM Instructor Research Study Survey

Greetings STEM Instructor,

My name is Jacqueline Wilson, and I am a doctoral student at VCU's School of Education. I am conducting a dissertation study on implicit bias in the STEM classroom. As an instructor of a STEM class, your input is valuable to me as I continue to explore this topic. A mixed methods design is being utilized for this study. You are invited to take part in the first phase of the research study which is the survey. The survey will take about 5 to 10 minutes to complete. At the end of the survey, you will be asked whether you are interested in participating in the second phase of this research which will include classroom observations, observation review sessions, and a final interview. If interested, you will then be asked to provide your contact information so the researchers can follow-up with you.

A study information and consent form is attached. Please feel free to contact me if you have any questions about this study. Please use the link below to complete the survey. By completing this survey, you are consenting to participating in the survey phase of this study.

Link

The survey will close after 14 days.

Thank you for your time.

APPENDIX B

Informed Consent Form

TITLE
An Exploration of a Researcher-Instructor Partnership in Implicit Bias Awareness and Mitigation in College STEM Classrooms: A Mixed Methods Study

INTRODUCTION
It was estimated that 2.4 million jobs in the fields of science, technology, engineering, and mathematics (STEM) went unfilled in 2018 (Smithsonian Science Education Center, n.d). With a projection of 3.5 million STEM jobs needing to be filled by 2025, the gap in employment and unfilled jobs in the STEM fields is projected to remain static (Lazio & Ford, 2019) unless students are retained and matriculate in STEM fields. Currently, only 24% of ethnic minorities who enter college with majors in STEM fields graduate with a degree in STEM majors (Killpack & Melon, 2016). Data suggest although 40% of Black students and 20% of Latinos students transferred out of STEM majors, only 1.5% of White students did the same (Strayhorn et al., 2013). The discontinuation of STEM majors is often precipitated by course drops, failures, and withdrawals from barrier classes, which are defined as those requiring a passing grade to continue in a chosen STEM major. Research indicates Black students, not only those in barrier classes, but also those who continue in their chosen STEM major, often feel isolated, report a lack of peer support, and feel invisible to their professors (Strayhorn et al., 2013).

PURPOSE OF THE STUDY
The purpose of this study is to investigate whether a researcher-instructor partnership will be beneficial in bringing awareness to and mitigation of implicit bias in STEM course delivery.

DESCRIPTION OF THE STUDY
A mixed-methods study has been designed to explore whether a researcher-instructor partnership brings awareness and the potential for mitigation of the impact of racial implicit bias in course delivery and instructor interaction with Black students in STEM classes. The study consists of a survey, classroom observations, researcher-instructor collaboration, and a concluding interview.

RISKS
There are no known risks associated with this study.

BENEFITS
The goal of this study is to address course delivery to minimize feelings of isolation and invisibility often expressed by Black students, foster a sense of Black student connectedness to the classroom environment, improve Black student STEM efficacy, and reduce Black student

STEM attrition rates. Subsequently achieved are university initiatives to promote diversity and inclusiveness in the sciences while increasing the number of STEM professionals prepared to fill over 2 million unfilled STEM positions.

COSTS
There are no financial obligations required to participate in this study.

PAYMENT FOR PARTICIPATION
No monetary payment or any other form of financial compensation will be provided to participants.

CONFIDENTIALITY
The identity of participants will be kept confidential. Participants will not be identified by name.

VOLUNTARY PARTICIPATION AND WITHDRAWAL
Participation in this study will occur on a voluntary basis. Participants are free to withdraw from this study at any time.

INVESTIGATOR
Jacqueline G. Johnson Wilson
Doctoral Student
Virginia Commonwealth University, School of Education
xxxxx@vcu.edu

FACULTY ADVISOR:
Dr. Jeffery Wilson
Virginia Commonwealth University, School of Education
xxxxx@vcu.edu

QUESTIONS
Please direct questions regarding this study to the investigator or the faculty advisor.

CONSENT
I have read and understand the provided explanation of this study. I have had my questions answered to my satisfaction. I voluntarily agree to participate in this study.

_____ _____

Participant Name Participant Signature

APPENDIX C

Implicit Bias Partnership Study

Confidential

Implicit Bias Partnership Study

Survey responses are returned anonymously. If you choose to participate in Phase 2 of the study or if you have questions about the study and provide your contact information at the end of the survey, responses may not be anonymous.

Thank you for taking the time to complete this survey!

Do you instruct a university STEM class?
- ○ Yes
- ○ No

What course(es) do you instruct? (select all that apply)
- ☐ Biology (introductory)
- ☐ Biology (other than introductory)
- ☐ Chemistry (introductory)
- ☐ Chemistry (other than introductory)
- ☐ Physics (introductory)
- ☐ Physics (other than introductory)
- ☐ Engineering (introductory)
- ☐ Engineering (other than introductory)
- ☐ Mathematics (introductory Calculus)
- ☐ Mathematics (other than introductory)

Have you attended racial implicit bias training? ○ Yes ○ No

	Disagree Strongly	Disagree	Agree	Agree Strongly
I understand the phenomena of racial implicit bias.	○	○	○	○
I am aware of the impact of racial implicit bias to Black students in STEM majors.	○	○	○	○
I ensure examples used during lectures represent diverse perspectives.	○	○	○	○
I ensure visual media presentations are racially/culturally diverse.	○	○	○	○
I purpose to speak individually to all students enrolled in the class.	○	○	○	○

How long have you been a university STEM instructor?
- ○ 1-6 years
- ○ 7-12 years
- ○ 13+ years

I identify as:
- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Pacific Islander
- ☐ White

Are you willing to partner with a researcher to create a more inclusive classroom through an exploration of implicit bias?
- ○ Yes, sign me up
- ○ Somewhat, I need more information
- ○ No, I'm not interested

Thank you for completing the survey. Please share the reason(s) you are not interested in continued participation in this study. _____

Please share the reason(s) you are not interested in continued participation in this study.	_____
Please provide your name, email address, and any questions you have regarding the study or send your questions to Jacqueline Wilson at wilsonjg3@vcu.edu.	_____
Please provide your name, email address, and undergraduate class(es) you will instruct in Fall 2021.	_____

APPENDIX D

Observational Protocol

Interaction initiated by Ethnicity Field Notes

I/S	Asian	Black	Latino	White	Unknown	Description of engagement

I/S – Indicate whether action initiated by instructor or student.

APPENDIX E

Study Protocol Email to Phase 2 Instructors

I hope this email finds you well. I am looking forward to working with you over the next several weeks. As the start of the semester approaches, I would like to review my plan for observations of *(Class, section, day, time).*

Observations will begin the week of August 23rd and commence with the first scheduled class. The following is an overview of the study protocols:

1. I will observe at least one class per week. I would like to leave the option open to observe a second class to ensure adequate data collection.
2. We will need to select one meeting day each week to share my observations with you. Please provide two days and times from which to choose. Ideally, the day selected will be a day we will meet each week for the 6-week duration of data collection. I anticipate a 30-minute meeting will be sufficient to present pertinent information and have dialogue about the observations. Weekly meetings will begin the first week of class. If our first weekly meeting cannot be held until the second week of class/observations, the meeting should take place before the second week's observation. For example, class observations are held on Thursday and weekly meetings are agreed upon for Monday, our first meeting will occur in the second week.
3. We will need to schedule a final interview for the week of October 4th. Please provide two possible dates and times that would allow one hour for this interview.

Please note: I would prefer to hold the weekly meetings and final interview in person, perhaps, in your office, the library, or other agreed upon space. I am fully vaccinated and committed to following COVID safety protocols; however, I completely understand if you would prefer to meet via Zoom.

Prior to the first day of class please ensure I have the following:

A. a finalized version of the course syllabus
B. access to the course online platform (if applicable). Please let me know if this requires my [student ID]#.
C. two potential days and times we can hold a weekly meeting. Please allow for 30 minutes.
D. your preferred meeting modality, in person or via Zoom

It is my hope to seamlessly embed into your course. To ensure authenticity of interactions and observations, minimal impact to the learning environment, and your confidentiality, I am requesting that the nature of this study not be revealed to students in the class.

I am excited to begin this study and look forward to the work of our partnership contributing to the literature on the mitigation of implicit bias. Please let me know if you have any questions.

APPENDIX F

Vignette 1: Grandmother's Impact

When I was an undergraduate student at Rutgers, I often went to visit my grandmother, who did not live far from campus, on the days when I had a lengthy period of time between classes. On one visit, I recall sitting on the gold carpet. Like many grandmothers, she had matching gold upholstered furniture covered in plastic. As I sat on the floor, she sat on the sofa having a conversation with one of her daughters-in-law, my aunt. The conversation was very heated. I, of course, could only hear one side of the conversation. My grandmother said something very heated and then hung up the phone. Immediately after hanging up the phone, she exclaimed, "You can't trust dark gummed people!" Yes, gum as in the flesh that sits around our teeth. It is important to note that my aunt is of Indian descent (not Native American) and had dark gums. I simply continued my visit, headed back to campus, and gave it no further thought.

Fast forward about 25 years. Two of my daughters are in high school, one in the ninth grade and one in the 11th grade. My ninth grader was (and still is) quite the busy body. She often came home with information pertaining to the best friend of her sister, my daughter in the 11th grade. The information usually did not paint the best friend in a good light. I was concerned that this friend was having a negative influence on my daughter. One day, my daughter, a busy body ninth grader, came home with information that she called 'the tea.' The information infuriated me, and I blurted out, "You can't trust dark gummed people!" Yes, the *exact* same words my grandmother used 25 years earlier. As indicative of implicit bias, it reared its ugly head in a moment of stress.

Having been fully engaged in implicit bias research at the time, my mouth dropped, and I could not believe I just said those words. I was forced to examine whether or not my displeasure with the best friend was influenced more by my own implicit bias than by anything I was told she did or said. Yes, I did notice that she had dark gums when I met her, but I did not consciously associate that observation with my grandmother's statement. It is now obvious that the only reason I noticed her gums was because of my grandmother's comment. I questioned how much my grandmother's comment influenced my reactions. Did I ever give her best friend a fair chance?

This example demonstrates how elusive implicit bias can be. It took 25 years to manifest itself. Not knowing the specific interactions, conversations, and influences I have had, no one observing this interaction could have ever said to me, "Girl, you just had a moment of implicit bias." At that moment, I was the only one who could trace that statement back to its origins. Hence, from this example we see the importance of self-interrogation of experiences, conversations, interactions with and the influence of family, friends, and acquaintances in the effort to root out implicit bias.

APPENDIX G

Vignette 2: It Must Have Been Osmosis

As a senior in high school, I took physics. Our class was small, maybe 12 students. I had a physics teacher who always walked around the school in a lab coat and always had a physics demonstration set up in the classroom when we arrived. Sometimes, they took up a third of the room. I often wondered why he didn't let the students participate in setting up the demonstrations. Graduation day came. Finally! Graduation ceremonies were held on the football field, but for some reason I had to go into the building. As I walked into the building in full regalia including my honor cords, my physics teacher was on his way out of the building. As he passed me, he looked and then said, "It must have been osmosis." I smiled but felt kind of offended by the statement. I was so happy to be graduating that I just went about my business. The statement never left my memory. Not until I was older did I realize how offended I really should have been.

Ignored

I also remember being in history class, honors history. Again, there were few of us in the class. In the front right of the room sat all the White male students in the class, about five of them, and Malik (the only Black male in the class). I sat toward the back of the middle row. Generally, I was the only one in the row. The teacher sat at the top of that middle row, at his lectern facing the students. Two or three girls sat on the left side of the room. Other than attendance in the beginning of the school year, I do not recall him ever saying my name or calling on me. His attention was often directed at the males in the front right corner of the room to ask questions, field responses, and have general conversations.

The Lesson

These experiences have not been lost to the recesses of my mind, even though decades have passed. I have often wondered how these experiences really impacted me. Did they cause me to be less engaged with White male instructors in college? Did I believe White male instructors just did not care about me as a student or as a person? Surely, I will never have a measurable answer to this question. The lesson to be learned from these experiences is that students bring to the classroom their own experiences and possible biases. Instructors must be aware that a quiet student may not be disengaged or uninterested. In this situation, the attribution of a stereotype, which is often influenced by bias, might be the comfortable fallback. Hence, the importance of engaging all students.

APPENDIX H

Vignette 3: Self-Interrogation

Lydia X.Z. Brown, lawyer, educator, activist explains expounds on the importance of fostering a safe learning environment as educational institutions return to in-person teaching:

"I believe that everyone brings their lived experience to the work that they do whether they realize it or not. A very specific framing of privilege is to presume it is possible not to bring your whole self to the work that you do. It is the epitome of privilege to pretend that you can enter a classroom somehow neutral, objective, devoid of any external or outside beliefs, or any preconceptions, or any life experiences."

Taken from:

Chideya, F. (2021, September 20). When public health saves lives, returning to in-person education with a disability, and Texas abortion ban's impact on women of color. *Our Body Politic*. https://our-body-politic.simplecast.com/

APPENDIX I

21 Teaching Strategies for Student Engagement and Equity

Giving students opportunities to think and talk about STEM	
___1. Wait time	→ allow students time to think before fielding response
___2. Allow students time to write	→ have students write answers to questions instead of calling out/raising hands immediately
___3. Think-pair-share	→ have students consider response, collaborate with a partner, and then share in full class discussion
___4. Do not try to do too much	→ strategically manage approaches to learning
Encouraging, demanding, and actively managing the participation of all students	
___5. Hand raising	→ to avoid repeated calling out by same students
___6. Multiple hands, multiple voices	→ select more than one student to respond to question or comment
___7. Random calling using popsicle sticks, index cards, name randomizer apps	→ be careful with this; notify class that this method will be used to encourage participation; be mindful of cultural norms of international students
___8. Assign reporters for small groups	→ use small groups to encourage community; a a reporter encourages dialogue
___9. Round-about	→ best in smaller groups; all will have a chance to share
___10. Monitor student participation	→ walk around to groups; does everyone have opportunities to engage?
Building an inclusive and fair STEM classroom community for all students	
___11. Learn or have access to students' names	→ as class size allows, use name tents or other methods that allow you to know and use student names
___12. Integrate culturally diverse and relevant examples	→ this may take research to uncover "hidden" contributors to a subject area; think outside of the dominant narrative
___13. Work in stations or small groups	→ helps to build community and foster belongingness; watch for affinity bias and encourage by all members of the group
___14. Use varied active learning strategies	→ course specific; various ways to learn/present knowledge
___15. Be explicit about promoting access and equity for all students	→ best to establish this early via diversity, equity, and inclusion (DEI) statement in syllabus and during first day introduction of class
Monitoring (your own and students') behavior to cultivate divergent STEM thinking	
___16. Ask open-ended questions	→ utilize strategies 1, 2, and 3
___17. Do not judge responses	→ cultivate safe space for sharing
___18. Use praise with caution	→ this is easy access for implicit bias to enter
___19. Establish classroom community and norms	→ establish DEI positionality and expectations early
Teach all students in your STEM classroom	
___20. Teach them from the moment they arrive	→ make sure learning objectives and expectations are clear
___21. Collect assessment evidence from every student, every class	→ first day 'get to know you' assignment: goals for the class, career, etc.; consider using Clicker, Kahoot Mentimeter, etc. for large classes; consider a midterm student assessment of the instructor to gauge teaching, learning, and engagement

Adapted from: Structure Matters: Twenty-one Teaching Strategies to Promote Student Engagement and Cultivate Classroom Equity by K. Tanner (2013)

APPENDIX J

Strategy – Stereotype Threat Mitigation

1. Provide students the opportunity to reflect on things that they personally value or feel proud of (in the course) . . . this can increase performance
2. Write an affirmation statement at the top of the exam, have students recopy it (or read, say it to themselves)
3. In conjunction with number 1—Minute papers: Have students share something they enjoyed learning about or a skill they proudly developed in the course
4. Structured goal setting: Have students write about their ideal futures, prioritize and strategize their goals, plan for setbacks, and plan for monitoring progress

Adapted from:

Killpack, T., & Melon, L. (2016). Toward inclusive STEM classrooms: What personal role do faculty play? *CBE-Life Sciences Education, 15*(3), 1–9.

APPENDIX K

Diversity Training Terms Quiz

1. Occurs when a person from an underrepresented group is assumed to belong to a lower social category or position:
   a. Failure to differentiate
   b. Status leveling
   c. Stereotype replacement
   d. Stereotype suppression

2. When members of a minority group are treated as representative of their entire group rather than as individuals, especially when they are a numeric minority or the only person from that group present, it is termed:
   a. Individuation
   b. Microinequities
   c. Stereotype replacement
   d. Tokenism

3. Scenario: A professor says to a student "I believe that attention to race is unimportant, because racism doesn't exist anymore."
   a. Color-blind racial attitudes
   b. Failure to differentiate
   c. Microaggression
   d. Stereotype

4. Scenario: A student confuses one black graduate student with another black graduate student.
   a. Color-blind racial attitudes
   b. Failure to differentiate
   c. Microinvalidation
   d. Status leveling

5. The intrinsic or ingrained biases that cause us to automatically sort people into groups is termed:
   a. Explicit bias
   b. Implicit bias
   c. Racial colorblindness
   d. Stereotype suppression

6. Characteristics and knowledge of a particular group of people, which encompasses language, religion, cuisine, social habits, music, and arts is termed:
   a. Culture
   b. Individualism
   c. Race
   d. Social categorization

7. The everyday verbal, nonverbal, and environmental slights, snubs, or insults, whether intentional or unintentional, which communicate hostile, derogatory, or negative messages to target persons based solely upon their marginalized group membership is termed:
    a. Failure to differentiate
    b. Microaggression
    c. Shifting standards of judgment
    d. Tokenism

8. The presumed incompetence of members of underrepresented groups, which causes well-qualified underrepresented individuals to be judged as highly competent, compared with members of their group, but they are held to even higher standards and require greater proof of competence than comparable members of the majority group is termed:
    a. Competency proving
    b. Discrimination
    c. Failure to differentiate
    d. Shifting standards of judgment

9. A category of people who identify with each other based on similarities, such as common ancestry, language, society, culture, or nation is termed:
    a. Diversity
    b. Ethnicity
    c. Genetic ancestry
    d. Race

10. The deliberate, conscious, easy to self-recognize systemic prejudice and/or discrimination is termed:
    a. Explicit bias
    b. Implicit bias
    c. Microaggression
    d. Microinequities

11. The inclusion of different types of people (such as people of different races or cultures) in a group or organization is termed:
    a. Culture
    b. Diversity
    c. Ethnicity
    d. Racial colorblindness

12. The action or state of including, or of being included within, a group or structure is termed:
    a. Bias
    b. Diversity
    c. Exclusion
    d. Inclusion

Taken from
Harris-Bernard, L. M. et al (2020). Knowledge gains in a professional development workshop on diversity, equity, inclusion, and implicit bias in academia. *Advances in Physiology Education*, *41*, 286–294.

APPENDIX L

Final Interview Questions

1. Please share why you were interested in this study?
2. How comfortable were you with being observed during lectures?
3. How comfortable were you discussing observations during weekly sessions?
4. What is your comfort level in discussing race?
5. We spent approximately 30-45 minutes per week discussing observations and strategies to minimize implicit bias. Was this time allotment reasonable based on your schedule? What suggestions do you have regarding the scheduling of weekly meetings?
6. How did the vignettes impact your thinking about implicit racial bias? Did they cause you to think about where or how you may have been exposed to situations that contributed to implicit bias? (gentle probes as needed)
7. Based on feedback shared during our weekly meetings, do you plan to try any of the strategies discussed or implement any changes?
8. How have your thoughts on implicit bias been impacted by this study?
9. What was most beneficial about the partnership?
10. What was least beneficial?
11. What could I have done to make the partnership more beneficial for you?