The Impact of the Advisor-Advisee Relationship among Black and Latino/A/X Stem Graduate Students at Predominantly White Institutions

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THE IMPACT OF THE ADVISOR-ADVISEE RELATIONSHIP AMONG BLACK AND LATINO/A/X STEM GRADUATE STUDENTS AT PREDOMINANTLY WHITE INSTITUTIONS

by

Tasia C. Bryson

A dissertation submitted to the Graduate College in partial fulfillment of the requirements for the degree of Doctor of Philosophy
Mallison Institute for Science Education
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THE IMPACT OF THE ADVISOR-ADVISEE RELATIONSHIP AMONG BLACK AND LATINO/A/X STEM GRADUATE STUDENTS AT PREDOMINANTLY WHITE INSTITUTIONS

Tasia C. Bryson, Ph.D.
Western Michigan University, 2021

An advisor is often the most central and powerful person influencing a student’s trajectory through graduate school (Barnes & Austin, 2009). This dissertation consisted of three articles that focused on the impact of the advisor-advisee relationship among Black and Latino/a/x students in STEM graduate programs at predominantly White institutions (PWIs) from the student perspective. Two frameworks were used to analyze data and guide the research: Black Feminist Thought (BFT) and Critical Race Theory (CRT). BFT was used to explore Black women’s experiences at Predominately White institutions as it provides an in-depth understanding of Black women’s perspectives. CRT was used when exploring Black and Latino/a/x students because it focuses on race and racism and challenges traditional paradigm methods and text impacts communities of color. Using a qualitative research approach, data were collected through six unique semi-structured interviews over three years with each participant. The interviews were audio-recorded, transcribed, and then analyzed with emergent coding. This study’s data emerged from a more extensive study focusing on the experiences of Black and Latino/a/x students enrolled in STEM/SBE graduate programs at three PWIs in the Midwest. Purposeful sampling was used from this larger population to identify nineteen Black and Latino/a/x students in STEM graduate programs for a more in-depth analysis of the advisor-
advisee relationship. Findings suggest students select their advisors for various reasons: personality compatibility, lab availability, research interest, funding, and faculty interest in working with a student. Participants reported that their relationship with their advisors changed over time. Accessibility, trust, and communication were recurring themes that influenced the advisor-advisee relationship. Advisors influenced Black and Latino/a/x students’ career decisions when they asked about career interests, discuss career options, be a role model, and assisting with networking and resources. Findings from this study may help inform advisors on how to assist minority advisees at PWIs better.
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Tasia C. Bryson
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LIST OF ABBREVIATIONS

**STEM**- Science, Technology, Engineering, Mathematics

**Minority**-according to the National Science Foundation, includes African Americans, Mexican-Americans, Native Americans (American Indians, Alaska Natives, and Native Hawaiians), Pacific Islanders, and mainland Puerto Ricans.

**Black/African American**-For the purpose of this dissertation, Black/African American will be used interchangeably based on the literature.

**URM**- Under Represented Minority

**HBCU** Historically Black Colleges and Universities are institutions of higher education in the United States that were established before 1964 with the intention of serving the black community.

**PBI**- Predominately Black Institution, Serve at least 1,000 undergraduate students. Have at least 50% low-income or first-generation degree-seeking undergraduate enrollment. Have a low per full-time undergraduate student expenditure in comparison with other institutions offering similar instruction, and enroll at least 40% African-American students.

**PWI**- Predominantly white institution Institutions of higher learning in which Whites account for 50% or greater of the student enrollment.

**NIH**-National Institute of Health

**DoD**– Department of Defense

**AGEP**-Alliances for Graduate Education and the Professoriate
List of Abbreviations---Continued

TA- Teaching Assistant

RA- Research Assistant

Advisor/Mentor-For the purpose of this dissertation, the terms advisor and mentor are defined as the relationship between the research advisor and graduate student
CHAPTER I

INTRODUCTION

Minority students in Science Technology Engineering Mathematic fields have a lower degree completion rate than White students (Arcidiacono et al., 2016). There are also differences by ethnicity for students who initially major in STEM versus students who graduate with a STEM degree; 43% for White students compared to only 29% of Latina/o students and 22% of Black students who start with a STEM major complete a STEM degree (Eagan et al., 2015).

The under-representation of women in STEM is a worldwide phenomenon (Montoya, & Jiang, 2017; Stoet, & Geary, 2018). The percentage of women who received a STEM degree in the United States is lower than the percentage of men (Smith-Barrow, 2014). Women in STEM have a retention rate of 25% compared to men who have a retention rate of 40% (Holland-Hunt et al., 2007). The low retention rate for women in STEM is a significant issue, with implications such as earning potential and social justice (Espinosa, 2008).

Women constitute 47% of the workforce and 28% of the Science and Engineering (S&E) workforce (National Science Board, 2018). According to Strayhorn, (2009), women make up only 25% of careers in the STEM field. Especially in higher education, Black and Hispanic women in science and engineering complete their doctoral degrees at a lower rate than White and Asian women. Combined, White and Asian women make up 86% of doctoral graduates while Black women make up 2.7%, Latina women make up 3.1%, and other racially underrepresented women in science and engineering are at 3.1% (National Science Foundation, 2017).
There are many reasons why minority women are underrepresented in science and engineering (Smith-Barrow, 2014). Women often struggle to develop a sense of belonging, lack female professors role-models, and have to deal with sexist language and methodology that perpetuate gender divides and systematically excludes women and minorities (Bystydzienski & Bird, 2006). Over time, several theories have been presented to explore the urgency and importance of instructors’ similar racial and gender characteristics on a student’s academic performance and outcome (Bey et al., 2019; Collins, 1998). Black Feminist Thought is a theory that argues Black women face unique experiences because they are Black and women (Hill-Collins, 1990). Critical Race Theory gives oppressed individuals a voice to illustrate issues that race, which continues systematic racism (Delgado & Stefancic, 2017). Intersectionality theory allows researchers to explore how various factors of discrimination combine, overlap, and intersect (Hill-Collins & Bilge, 2016).

Previously scholars indicated a reoccurring challenge for minority students is building relationships with faculty (Baker & Griffin, 2010; Golde, 1998). Many minority students search for professors of color and view them as role models; however, due to the low number of faculty of color, many students are unable to make that connection as often as their white counterparts (Baker & Griffin, 2010). According to Gregory (2001), Black female faculty and administrators can significantly influence students’ lives, and same-race role models in a STEM area can enhance and foster a sense of belonging.

It has been reported that students have a better educational outcome when interacting with a teacher/professor of their gender or race (Carrel et al., 2010; Crisp, & Cruz, 2009; Holmlund & Sund, 2008; Price, 2010;). In the higher education sector, mentoring has been reported to be one of the most effective components for improving rates of retention, graduation,
and pursuing STEM careers (Kendricks et al., 2013). Mentors at the graduate-level assist with building students’ capacity as scholars, fostering degree aspirations, and offering professional development opportunities (Reddick & Young, 2012). Commonly, graduate students receive this type of mentoring from their research advisor. Several published scholars have stated that the advisor-advisee relationship is critical to the graduate student experience (Barnes & Austin, 2009; Gardner, 2008; Gardner, 2010; Golde, 1998; Lovitts, 2005). Having a better understanding of how students selected their advisors, which factors contributed to the development of their relationship, and how the advisor-advisee relationship influenced student career options would allow faculty and staff to provide minority students in STEM graduate programs with a better graduate experience.

**Problem Statement**

The shortage of minority professionals impacts the global marketplace and harms global competitiveness (Hawley et al., 2014). White STEM majors are more likely to persist than their minority peers (Arcidiacono et al., 2016). Black and Hispanic STEM majors are significantly more likely to leave school than continue in their original field (Riegle-Crumb, et al., 2019). Additionally, the retention rate for women in STEM is a significant issue (Espinosa, 2008), as women complete STEM degrees at a lower rate than men (Smith-Barrow, 2014). The average attrition rate across disciplines for graduate school is 50% (Flores, et al., 2017; Nettles & Millet, 2006). Unfortunately, the attrition rate is higher among STEM disciplines (Aulck et al., 2017) and URM graduate students (Nettles & Millet, 2006). It has been reported that students that received mentoring from graduate advisors have a better graduate experience, although minority students tend to struggle with building these relationships (Griffin et al, 2010).
Mentoring has been reported to be one of the most effective components regarding improving retention, graduation rate, and STEM careers (Kendricks et al., 2013). Mentoring is critical for URM students in graduate programs because mentors can assist students to navigate through an unknown process (Lovitts, 2002). Mentees tend to select their mentors based on shared ethnic and cultural values (Alvarez et al., 2009). Additionally, Castellanos et al. (2006) and Gonzalez-Figueroa and Young, (2005) recognized that sociocultural and language similarities might influence how students select mentors to develop relationships with them. Sadly, minority students often search for a professor of color to serve as a role model. However, due to the low number of minority faculty, students cannot make that connection as often as their White counterparts.

Graduate students often seek a mentoring relationship from their research advisor, which amplifies the importance of advisor selection. Unfortunately, many students are not aware of what they need from an advisor before making their selection. The selection of an advisor is critical because the relationship will have a significant impact on the overall graduate experience. Selecting an advisor is often a challenge for minority students because they have difficulties building relationships with faculty members at PWIs. Many URM students must choose an advisor from a different ethnicity due to the small number of minorities in STEM faculty positions.

Additionally, students in STEM fields work with their advisors for years; therefore, selecting an advisor they can work well with is essential. It has also been reported that the advisor-advisee relationship can impact students’ career choices, but it is unknown if this is true for minorities in STEM. A better understanding of the advisor-advisee relationship and its impacts on URM students could increase the number of minorities in STEM fields.
Significance of the Research

Although several grant programs have targeted minority participation in STEM and some progress has been made, minorities continue to be underrepresented among degree recipients in STEM fields (Perna et al., 2009). There is a limited amount of research that focuses on how the advisor-advisee relationship impacts Black and Latino/a/x students in STEM graduate programs, explicitly using frameworks developed to explore minority students’ experiences in-depth. In contrast, many scholars who have focused on the advisor-advisee relationship are faculty from the humanities and typically focus on graduate students within their discipline. To understand the impact of the advisor-advisee relationship, it is important to understand students’ perspectives, especially in STEM.

This research aims to provide PWIs with a better understanding of the importance of advising Black and Latino students in STEM programs and developing best practices for advising. By exploring these relationships, students will have a better understanding of the importance of the advisor selection process, which factors contribute to the change of the advisor-advisee relationship, and how the relationship between advisors and their advisees may influence advisees’ career choices. Also, Black and Latino/a/x students may have a better experience if PWIs are aware of some of the challenges related to advisors’ advising styles. As for faculty, they will have a better understanding of the challenges that Black and Latino/a/x students face in graduate degree programs at PWIs. If faculty have a better understanding of their students’ needs, they will be able to assist them better. This study will illuminate how the advisor-advisee relationship impacts Black and Latino/a/x STEM graduate students’ career decisions. If the type of relationship students have with their advisors influences their decision to join the academy, this is critical for advisors, students, and higher education as a whole. Due
to the shortage of minority faculty in STEM, it is essential to know if the advisor’s role may influence their decision to join the academy.

This research contributes to the knowledge base of both faculty and graduate students. The findings from this dissertation may assist students with identifying an advisor that will provide the type of advising they desire. Additionally, students need to understand the importance of making this decision and know what should be considered before making it. The findings may also give a better understanding of how the advisor-advisee relationship may change over time. Some students debate switching advisors; this dissertation may provide insight on whether changing early is beneficial or if working out the challenges is best. Ultimately, this project can lay the foundation for developing workshops for students and faculty (separately and combined) to promote more effective and supportive relationships. Even something as simple as an advisor informally asking their advisee questions about advising preferences (hands-on/hands-off) to best suit their needs and preferences. This research may start a conversation about various advising styles at the graduate level.

Without knowledge about the advisor-advisee relationship and the advisor selection process, Black and Latina/x/o students will continue to select their advisors based on shared research interests, funding, availability, etc. and overlook critical factors that might improve their graduate experience. Students may not understand why the advisor selection process is crucial to their graduate experience and how it may influence their trajectory. Both students and faculty might not understand how their relationship may change over time, and the factors that contribute to this change will remain unknown. Although the advisor’s actions are essential to the advisee, without the students’ perception, how the advisor influences Black and Latino/a/x STEM graduate students’ career choices will remain unknown. This work on the advisor’s
actions on Black and Latino/a/x STEM graduate students’ success can contribute to improving the retention rate of URM students in higher education and identifying factors in the advisor-advisee relationship that predict URM students’ interest in pursuing a faculty career.

**Research Purpose**

The majority of STEM graduate programs require students to produce a certain amount of research to complete their degree, which requires them to work closely with a faculty member. However, it has been reported that URM students who attend a PWI tend to struggle with connecting with faculty members (Woldoff et al., 2011). The advisors’ communication style impacts the students’ experiences in various ways. This three-article dissertation explores three aspects of advisor-advisee relationships and their impact on Black and Latino/a/x graduate students in STEM programs at PWIs.

The first article explains the thought process behind how Black women within the study selected their advisors and their perception of their relationship. Black Feminist Thought (BFT) was used to explore Black women’s experiences at predominantly White institutions (PWIs) as it provides an in-depth understanding from the perspective of Black women (Patton, 2009). The questions that guided the study were: how and why do Black women select their advisors and what are Black women perceptions of their relationship with their advisors? Data was collected using three unique semi-structured interviews over a year and a half with each of the four participants. The interviews were audio-recorded, transcribed, and analyzed with emergent coding. The interviews were used to create case studies. The findings from the first article showed the importance of selecting an advisor and how the advisees’ perceptions of their relationships with their advisors changed over time.
The second article explored the factors that influenced the advisor-advisee relationship as Black and Latino/a/x graduate students progressed through their program and how the relationship evolved. While the first article focused on four Black women, the second article included Black and Latino/a/x men and women. Critical Race Theory (CRT) was used to explore Black and Latino/a/x experiences at predominately White institutions as it provides an in-depth understanding of the issues in postsecondary settings (Patton, 2006). Using a qualitative research approach, data was collected through six individual semi-structured interviews over three years with each participant. The interviews were audio-recorded, transcribed, and analyzed with emergent coding. The findings suggest students’ perceptions of their advisors change over time due to three recurring themes: accessibility, trust, and communication.

The third article continued to look at Black and Latino/a/x students as a whole to generate a better understanding of the role the advisor-advisee relationship has on students’ career choices. The article explored how the advisors actions affects Black and Latino/a/x students’ interests in careers in academia or outside it. CRT was used to explore Black and Latino/a/x experiences while analyzing the role of race and racism in perpetuating social disparities between dominant and marginalized racial groups at Predominately White Institutions. Through a qualitative research approach, data was collected through six unique individual semi-structured interviews over three years with each of the 19 participants. The interviews were audio-recorded, transcribed, and analyzed with emergent coding. The findings from this study illustrate that Black and Latino/a/x students in this study benefited from advisors asking about career interests, discussing career options, being a role model, and assisting with networking and resources.
Theoretical Framework

The frameworks that guide this study are Black Feminist Thought (BFT) and Critical Race Theory (CRT). The purpose of using frameworks that use a critical lens for both gender and race was to provide an in-depth analysis of the experiences of minority graduate students in STEM programs. Frameworks that focus on race, gender, and/or both gives a voice to individuals who have a history of oppression in the United States. Typically, the frameworks illustrate how oppressed people’s experiences are related to systematic racism and social justice issues within the education system. It was critical to design a study that would allow the researcher to foster a feeling of connection and create a climate of respect. Applying a framework that allows intersectionality is important when dealing with underrepresented minority (URM) students at predominantly white institutions (PWI). Intersectionality considers how multiple identities may impact discriminatory barriers that URM students face at PWIs.

Black women experience double oppression daily because they are both Black and woman, thus are subject to structural racism and sexism (hook, 2014). BFT allows Black women to share their stories from their own experiences, including multiple identities that have influenced who they have become. BFT focuses on Black women’s experiences and consists of ideas and thoughts by Black women that clarify the standpoint of Black women (Howard-Hamilton, 2003). BFT framework is unique because it was formed to understand that Black women may have certain commonalities or outlooks based on class, region, age, and sexual orientation, but ultimately no two women are identical. Additionally, BFT was used to explore Black women’s experiences at Predominantly White institutions as it provides an in-depth understanding from the perspective of Black women (Patton, 2009). According to Collins (1986), Black women in majority-white spaces are viewed as the “outsider within.” Black
women are invited into places where dominant groups have gathered but remain “outsiders within” because they have no voice and are still invisible. Although Black women may be present, they are still not as valued and respected as their White or male counterparts.

CRT was used when minority students of all genders were explored because it focuses on both race and racism while it challenges traditional paradigms from the perspective of communities of color (Howard-Hamilton, 2020). CRT was be used to develop interview question that captures the unique experiences that minority students experience in a predominately white space. During the interviews, students will discuss their graduate experience from a unique perspective. CRT allow researchers to analyze the data to capture different histories and experiences of oppression (Delgado and Stefancic, 2017). CRT enable the researcher to explore how race and power may influence the advisor-advisee relationship. CRT contributes to inclusivity and diversity in higher education and addresses some criticisms as it pertains to practices such as affirmative action (Hiraldo, 2010). Originally, CRT was developed by scholars of color who focused on law and legal policies with the intent to dismantle laws and policies that were not race-neutral. CRT caught the attention of scholars within education because education systems were historically structured to educate white males and this legacy persists today. Through CRT, researchers can provide a voice to people who are systematically oppressed through counter-stories in the form of discussions, archives, and personal testimonies to capture an understanding of the person’s authentic experience. Understanding the experiences of minorities is critical to the study of higher education.
References


CHAPTER II

BLACK WOMEN IN STEM GRADUATE PROGRAMS: THE ADVISOR SELECTION PROCESS AND THE PERCEPTION OF THE ADVISOR/ADVISEE RELATIONSHIP

Abstract

An advisor is often the most central and influential person influencing Black women’s trajectory throughout graduate school (Rasheem et al., 2018). This study explored how and why Black women in STEM doctoral programs selected their advisors and their perceptions of the advisor/advisee relationship. Black Feminist Thought (BFT) was used to explore Black women’s experiences at predominantly White institutions (PWIs) as it provides an in-depth understanding from the perspective of Black women (Patton, 2009) and highlights often-ignored power dynamics. Data were collected using three unique semi-structured interviews over a year and a half with each participant. The interviews were audio-recorded, transcribed, and analyzed with emergent coding. This study’s data was compiled from a larger study focusing on the experiences of underrepresented minority (URM) students enrolled in STEM/SBE graduate programs at three predominantly White institutions in the Midwest. Purposeful sampling was used from this larger population to identify four Black women in STEM graduate programs for a more in-depth analysis of their advisor selection process and advisor-advisee relationship. Findings suggest students selected their advisors for various reasons: compatibility, lab availability, research interest, funding, and faculty interest in working with a student. Notably, participants preferred advisors who provided a hands-on advising style over a hands-off advising style. Additionally, students who developed a positive relationship with their advisor performed better academically and made better progress within their program compared to students who
viewed their relationship as less compatible. This study’s findings may help inform advisors, at predominantly White institutions, on how better to assist Black women advisees, thereby improving the degree completion rates and graduate program success for Black women in STEM.

Keywords: STEM, Black Women, Advisor Selection Process, Advisor-Advisee Relationship

Introduction

For decades there has been a shortage of trained professionals in Science, Technology, Engineering, and Mathematics (STEM) fields in the United States (Atkinson et al., 2007; Xue & Larson, 2015). Although the shortage of STEM professionals is universal, it is exceptionally high among underrepresented minorities (National Science Board, 2018). One possible explanation for this employment shortage is the racial and gender differences in STEM degree completion. Several researchers find that women tend to struggle more than men to complete degrees in STEM (National Science Board, 2018; Obiomon et al, 2007; Smith-Barrow, 2014). Specifically, Black women make up only 2.7% of advanced degrees awarded in science and engineering (National Science Foundation, 2015). Scholars have continuously produced work that suggests Black women experience unique challenges that may hinder them from completing their graduate programs (Patton & Harper, 2003; Walkington, 2017). Because successful PhD completion hinders on a successful interpersonal relationship with an faculty advisor who may not share similar background and experiences, Black women face a unique challenge in establishing relationships with faculty members.

The advisor-advisee relationship can be beneficial and can promote student persistence, degree completion, and retention in graduate programs (Lovitts, 2002). According to Lee
(2018), the advisor can make or break a Ph.D. student. Several studies have suggested the advisor-advisee relationship is a critical component to the overall graduate student experience (Barnes, et al., 2010; Goldman & Goodboy, 2014; Primé, et al., 2015; Schlosser & Gelso, 2001; Welde & Laursen, 2008). Prior studies have reported that effective advising is beneficial for Black women and can impact career aspirations (Patton, 2009; Patton & Harper, 2003). Conversely, Black women who receive ineffective advising are at a disadvantage and have a higher chance of not completing their program (Johnson-Bailey, 2004). However, the literature is sparse regarding how and why Black women in doctoral programs select their advisors and their perceptions of their relationships with their advisors. This study addresses these gaps by exploring why and how advisors were selected and identified several recurring themes that emerged from open-ended interview responses from Black women doctoral students regarding their advisor-advisee relationship.

Within this study, specifically the referenced literature, the term Black/African American and advisor/mentor will be used interchangeably based on the original authors’ preferences and preferred language. Advisor and mentor are two terms used interchangeably within the literature yet have different definitions and responsibilities and vary from person to person. For this study, we define the terms advisor and mentor as the relationship between the research advisor and graduate student.

**Related Literature**

**Black Women in Graduate Programs**

Previous research find that Black women have a unique experience in higher education because of their double oppression identity: Black and woman (Collins, 2002; Miles, 2012;
Walkington, 2017). Black women are often racialized and gendered in professional and educational settings (Seo & Hinton, 2009), particularly at predominantly White institutions (PWI). That Black women have struggled in PWIs is not uncommon because these institutions were designed around white men, the dominant group represented in academia. Spranggins (1998) implied that faculty and students assume that because of affirmative action, admitted Black students are unqualified and underprepared. In contrast, admitted white men are qualified and as a result of higher education structure and history, white men are labeled as the default and “ideal student” (Glazer-Raymo, 2001, 2008; Turner & Myers, 2000).

As with all graduate students, Black women who attend PWIs tend to benefit from mentoring relationships (Gooden, et al. 2020; Reddick & Pritchett, 2015; Tuitt, 2010; Walkington, 2017; Williams et al., 2005). Walkington (2017) explored the experiences of 11 Black women who completed their undergraduate degrees at historically Black colleges or universities (HBCUs) and chose to attend graduate school at a southern PWI. Walkington found that Black women face isolation and marginalization, racism and eroticization, microaggressions, have fewer funding, research, and network opportunities than their white and male counterparts, and risk dropping out of graduate programs. Despite these challenges, the author noted that mentoring can assist Black graduate students with adjusting to the PWI environment and navigating through challenging obstacles. Although it is common for women to struggle to complete degrees in a male-dominated program (Ulku-Steiner et al., 2000), black women share an addition burden of navigating racism at a PWI. The literature indicates that mentoring is critical for Black women, who report having less respectful and supportive primary advisors than all other groups (Chaftez, 1997; Choo & Ferree, 2010).
Advisor-advisee Relationship

A productive relationship between the advisor and advisee is essential to a graduate student’s overall experience (Austin, 2002; Creighton et al., 2010; Golde, 1998). Doctoral students value mentorship because it can help develop self-esteem, competence, and career efficacy (Carpenter et al., 2015). Several scholars have reported that students receive knowledge, advice, stimulation, and support from their advisors (Davidson & Foster-Johnson, 2001; Patton & Harper, 2003; Rasheem, 2018). Rutledge et al. (2011) indicated graduate students wanted their advisors to display supportiveness, a high level of interaction, provide regular reviews of progress, and treat the students as junior colleagues. Support from the advisor at the doctoral level is critical because many students are navigating through an unknown environment (Gardner & Holley, 2011; Reddick & Pritchett, 2015; Williams et al., 2005). Additionally, students rely on advisors to provide feedback and guidance on writing critiques, and recommend books and articles (Jones et al., 2013; Rasheem et al., 2018). When students receive feedback from their advisors, they can be more productive and progress within their program (Paglis et al., 2006). Typically, students who received mentoring had higher productivity versus students who did not (Williamson & Cable, 2003). It is important to note that higher productivity is more common when the advisor and advisee communicate effectively (Gelso, 2006; Paglis et al., 2006).

According to Goldman and Goodboy (2014), communication styles are essential to maintaining a positive relationship between students and advisors. Overall, students tend to prefer for their advisors to be accessible, helpful, social, and caring (Barnes, 2010). However, the advisor-advisee relationship may differ depending on the discipline (Austin, 2002; Golde & Walker, 2006; Noy & Ray, 2012). Specifically, students in the STEM graduate program work
closely with their faculty research advisor because of the amount of research required for completion. Welde and Laursen (2008) indicated STEM advisors are critical because advisors influence graduate student satisfaction, success during graduate school, and early career decision-making. Having an advisor in STEM is vital because Golde (2005) revealed that incompatible advising relationships, marked by a lack of interaction, trust, and academic support, were the cause of much of the attrition in science departments. For graduate students, the advisor-advisee relationship can help students complete their program and excel in their field, especially for minority students who are often first-generation students (Golde, 2005). Several studies highlight that minority students in STEM often struggle with identifying advisors and often have negative experiences with advisors, leading to lower completion rates (Baker & Giffin, 2010; Griffin, et al., 2010; Welde & Laursen, 2008).

Advising minority students in graduate STEM programs has been a concern for many scholars (Welde & Laursen, 2008), yet there are limited studies on the topic. Graduate populations need attention because Nettles and Millett (2006) found Black students’ rates of transitioning from undergraduate to graduate programs dropped 50% more than their Asian peers and 75% more than their White peers’ rates. Several scholars have acknowledged that minority students’ experience with advisors is critical and can differentiate attrition and retention (Brooms & Davis, 2017; Esposito et al, 2017). The advisor-advisee relationship for minority students is vital for students to gain access to spaces and opportunities that have been historically unavailable (Curtin et al., 2016; Noy & Ray, 2012). Advisors can provide support to minority students with research, publishing, career advice, and networking (Welde & Laursen, 2008). Although the advisor-advisee relationship is beneficial, it is common for minority students to
struggle building relationships with faculty, leading to a lack of guidance navigating through graduate-level programs.

Although minority students struggle with building relationships with faculty members in graduate programs, women may experience the mentoring process differently than men (Rose, 2005; Wilde & Schau, 1991; Zhao et al., 2007). Specifically, because of gender and race, Turner and Myers (2000) suggest that women of color experience more disadvantage than white women and men of color. Women from minority groups tend to seek out minorities and/or women faculty members who may understand their personal struggles (Crawford & Smith, 2005; Few, Stephens, & Rouse-Arnett, 2003), especially at PWIs (Walkington, 2017). Mentoring relationships are vital to African American women’s experiences and necessary for them to break the glass ceiling (Guido-DiBrito & Batchelor, 1988; Locke, 1997). Women who are in male-dominated fields such as STEM fields benefit from the advisor-advisee relationship because women of color are more likely to drop out at a higher rate (Fox, 2001; Fox et al., 2009; Herzig, 2004), at least in part, is due to lack of faculty mentors and extreme isolation (Borum & Walker, 2012). Black women who found an advisor they could trust helped them gain credibility, felt less isolated and peripheral, and provided opportunities for creative activities that support their psychosocial and cultural development (Wilson & King, 2016). Consequently, few studies have been conducted that focus specifically on beneficial advising styles for Black women, and the number is even lower for Black women in STEM. As we previously mentioned, different types of advising are needed for students in STEM disciplines. We know Black women experience double oppression; therefore, there is a need to focus on Black women in STEM graduate programs.
Advisor Selection Process

The advisor selection process is essential to the overall experience of the graduate student. According to Zhao et al. (2007), one of the most important acts in graduate school is selecting the right advisor. There is no universal method for choosing an advisor; this process varies by disciplines, departments, and institutions. Joy et al. (2015) examined the advisor selection process in STEM with a specific focus on factors influencing students’ decisions. The study identified criteria applied by students and faculty in making their choices. The results indicated students assessed potential advisors based on available funding, area of research, personality, ability to graduate students quickly, and career prospects for students. Barres (2013) did not suggest selecting solely on research interest.

The advisor selection process is a global concern. Ives and Rowley (2005) conducted a longitudinal study in Australia which examined the relationships of Ph.D. students and their supervisors (Australia uses supervisor and USA uses advisor). Twenty-one Ph.D. students and their primary supervisors were interviewed separately, three times over the course of a year. Findings suggest that students who felt involved in their supervisor selection, whose topics were matched with their supervisor’s expertise, and developed good interpersonal working relationships with supervisors were more likely to make good progress and be satisfied. Similarly, Lovitts (2002) found the advisor-advisee relationship beneficial to both the advisor and advisee when students selected their advisor instead of being assigned. Lee (2008) investigated doctoral students’ supervisors in the United Kingdom and concluded that the supervisor’s own experience (positive or negative) as a student influenced how they supervised their students. Therefore, advisors who had bad experiences as graduate students were likely more cautious in creating their students’ experiences.
Advisor selection is a crucial component to completing a doctoral degree. Although most U.S. graduate programs allow students to choose their advisors, little research has been conducted to understand how and why students select their advisors, especially Black women in STEM graduate programs. Most of the literature about advisor-advisee relationships is based on the student or advisor’s experience in the social science (Clark et al., 2000; Hollingsworth & Fassinger, 2002; Knox et al., 2006; Schlosser et al., 2011; Schlosser & Gelso, 2001; Schlosser & Knox, 2003), which have a different experience from students in the sciences. Since Black women in STEM benefit from advising and there are limited studies that focus on understanding how graduate students select their advisors, there is a need for this study.

Research on the advisor-advisee relationship may offer insight into better assisting graduate students in their program; specifically Black women in STEM programs. The purpose of this study was to examine the following:

- How and why do Black women select their advisors?
- What are Black women’s perceptions of their relationships with their advisors?

Framework

The framework used to understand the experiences of Black women in this study is Black Feminist Thought (BFT). BFT as a framework allows researchers to analyze a body of knowledge from Black women’s perspective and include their overall struggle with gender, race, and class inequalities. Using BFT as a framework acknowledges Black women’s struggle against multiple oppressions, considers the history of the country, and eliminates negative images of Black women (Collins, 1986; Few, 2007a). BFT framework is based on the understanding that Black women may have certain commonalities in outlook based on class,
region, age, and sexual orientation, but understands that no two Black women are identical (Collins, 1986; Few, 2017b).

Scholars started using frameworks based on race or gender to gather a more in-depth understanding of populations that encountered different experiences. Traditional frameworks that separate race tend to group Black men and Black women together. Grouping Black men and women are problematic because men have always been considered the dominant gender (hooks, 2014). For instance, many schools or private clubs accepted Black men before Black women could join. Frameworks that focus strictly on gender tends to group Black and White women together. However, Black and White women in the U.S. have taken historically different paths (hooks, 2014). According to Few (2017a), BFT is grounded in Black women’s historical experiences such as enslavement, anti-lynching movement, segregation, Civil Rights and the Black Power movement, sexual politics, capitalism, and patriarchy. Using a race or gender framework results in the marginalization of Black women and grouping their characteristics (race and gender) will not reflect the authentic experiences of Black women (Stephens & Phillips, 2005).

Specifically, BFT provides an understanding of Black women’s experiences in majority-White spaces (Collins, 1986). Howard-Hamilton (2003) discussed how Black women are invited into a place where dominant groups have gathered but remain “outsiders within” because they have no voice and are still invisible. It is common for Black women to take a subordinate status due to the oppression they experience (Howard-Hamilton, 2003). Higher education in America, past and present, is predominantly composed of white males. Black women have struggled to be present and respected in academia. Black women’s experiences are different from White men, White women, and Black men, which may result in difficulty understanding the thought
processes and experiences of Black women. BFT framework provides an outlet to redefine and explain the importance of the Black woman’s experience.

Due to double oppression, Black women have unique experiences in graduate programs (Lewis et al., 2016) and struggle to build effective mentoring relationships (Patton & Harper, 2003; Walkington, 2017). For the purpose of this study, BFT was used to (a) capture the lived experiences of Black women by placing them in the center of their own analysis (b) allow researchers to analyze narratives of Black women at PWIs, (c) and utilize how historical events help to understand present experiences. BFT was used to design the study, analyze the data, and interpret the findings.

Methods

This study was part of a larger, longitudinal project that investigated the experiences of 34 underrepresented minority STEM and Social, Behavior, and Economic Sciences (SBE) graduate students at three primarily White institutions (PWIs) in the Midwest. The larger project focused on identity integration for underrepresented minority (URM) STEM or SBE graduate students as they assimilated into their disciplinary community of practice. URM is defined as Black/African American-, Hispanic/Latino-, biracial-, or multiracial-identifying participants. Additionally, students had to be in the first or second year of their graduate program when they enrolled in the study. The participants consisted of 25 women and nine men, 19 were in STEM programs, and 15 were in SBE programs.

The PI accessed students for recruitment through their institutions’ registrar’s office. The registrar’s office sent a Human Subject Institution Review Board (HSIRB)-approved recruitment email to all students meeting the selection criteria: underrepresented minority, first- or second-year graduate student, and STEM or SBE graduate programs. Students were invited to complete
a pre-survey, which included demographic information, identity scales, and social support scales after consenting to participate. After the survey, participants were invited to provide their contact information in an unlinked online form to indicate interest in the study’s interview portion. All interested students were contacted, and interviews were scheduled. Over three years, five members of the research team conducted six unique interviews with each participant. Participants were interviewed using open-ended questions in a semi-structured protocol designed to gather detailed and in-depth information during one-on-one interviews. The interviews varied in length from 32-81 minutes depending on how much information the participant provided. All the interviews were audio-recorded and professionally transcribed. HyperResearch, a software program for managing and coding qualitative data, was used to analyze data.

Once interviews were thoroughly read, the research team developed emergent codes based on the participants’ responses. The five-member research team generated a codebook with code names, definitions, and example codes. The codebook provided a definition and an example for each code to clarify code meaning and increase consistency in usage. Each researcher was trained to read each transcript and identify the correct codes, including participating in a rigorous and lengthy intercoder agreement and codebook refinement process. Intercoder reliability was assessed before coding all transcripts. Fleiss’ Kappa coefficient (Schaer, 2012) calculated the research team intercoder reliability. ReCal3, an online tool, was used to calculate reliability because our research team consisted of five researchers (Freelon, 2010). Our research team scores ranged from 0.61 to 0.80, which indicated “substantial agreement” using the kappa statistics agreement measures for categorical data scale (Landis & Koch, 1977; p. 165). Each transcript was coded and discussed by three researchers to increase accuracy, limit bias, and ensure the intercoder agreement was met.
Given the limited number of Black women at participating PWI’s in STEM graduate programs, purposeful sampling was used to identify students whose data would be included in this study (Patton, 2002). All STEM graduate students from the larger study who identified as Black women were included as participants in this study. Due to the limited number of Black women in this study, we included masters and doctoral students to provide robust findings. Black women were selected because of their unique experience with their advisors in STEM graduate programs at PWI have yet to be fully understood. Three interviews per participant were analyzed, capturing the beginning of their graduate program. It was important to select students at the beginning of their program to capture their interaction with their advisors over time. The data analyzed focused on the participants’ relationships with their advisors.

This study employed a phenomenological case study approach to understand the live experiences of four Black doctoral STEM students enrolled at a PWI in the Midwest. We use this qualitative research approach, specifically phenomenology (Creswell, 2009), informed by BFT (Collins, 2002) to capture a detailed examination of the advisor selection process and preferred advising styles of Black women at PWIs in STEM graduate programs, focusing on structural, racial, and gendered interactions that highlight persistent inequities. The bounded case study design focused on gaining an up-close, in-depth understanding of the impact of the advisor-advisee relationship on four Black women’s experiences. A case study was developed for each participant based on data collected from the more extensive study (Merriam, 2015). Case studies allowed researchers to examine in-depth data relating to several critical variables that influenced the experiences (Ghauri, 2004) of Black women in predominately White spaces and meanings that each individual gives to role of intersectionality in their graduate experience. Using a phenomenological approach allows the researcher to gain an understanding of the
complex prejudices Black women face. This study highlights intersectionality such as, but not limited to, race, class, gender, sexual orientation, and religion as it applies to overlapping identities and experiences (Few, 2007a).

Four emergent codes were developed to describe how and why Black women chose their advisors and if their personalities were described as a match, mismatch, or neutral. The codes were used to capture the participants’ advisor selection process and their relationships with their advisors who were either male, White, or both and how it impacted their experience in graduate school. Upon completion of coding, the coded text was used to create case studies. The codes provided the researchers with information about how and why the advisee selected her advisor, if her advisor was a match, mismatch, or neutral, and a glimpse into their relationship over a short period (a year and a half).
Table 1

*Codes, Definition and Examples*

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisor Selection Process</td>
<td>Describing how or why participants selected their advisor.</td>
<td>“I felt like we really connected, and I was like oh, I could see myself working with this person” (COURTNEY).</td>
</tr>
<tr>
<td>Good Match</td>
<td>Describing she likes the advising style of the advisor and why.</td>
<td>She has a pretty open-door policy, so if you ever need to go talk to her she’s available.</td>
</tr>
<tr>
<td>Mismatch</td>
<td>Describing she does not like the advising style of the advisor and why.</td>
<td>Yeah, I would describe it as very well (RUTH).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I think that my advisor in particular could do more to kind of ensure that her students are – because I’m in a situation where I’m in a research group, but I think my advisor could be more helpful in helping me determine a specific project.... That’s been my toughest challenge so far, is deciding whether this is the type of mentorship I need. (RUTH)</td>
</tr>
<tr>
<td>Neutral</td>
<td>Describing she has no change or the statement is not like/dislike as it pertains to the advisor relationship.</td>
<td>Another example is “I mean it hasn’t changed much, my relationship with my advisor, how I see her” (CODY).</td>
</tr>
</tbody>
</table>

Table 1 provides a definition and example for each code. The code “advisor selection process” was used to capture a better understanding of how and why Black women made their
decision. Specifically, this code was used to identify portions of the interviews where participants discussed how they selected their advisor in order to gain a deeper understanding of the students’ reasoning behind selecting their advisors. Once the decision was made and students started working with their advisor, they could see if their selected advisor matched their preferred advising style. The code “good match” was used to identify transcript sections that described how and why Black women preferred their advisors’ style. The code “mismatch” was used when participants explained why they did not prefer their advisors’ advising style. The “neutral” code was used when Black women’s statements were neither negative nor positive. This code was also used when students stated there was no change in their relationship.

**The Researcher (Reflexivity)/ Trustworthiness/Limitations**

Reflexivity is defined as the process of examining oneself as a researcher and the research relationship equally (Pillow, 2010). Qualitative research is known to have a continuous reflection on the research process (Creswell & Clark, 2017). In this case, the primary researcher (first author) is a Black woman in a STEM graduate program. The second author is a White woman who is in a faculty position in the STEM field. Having a student and faculty member, Black and White, increased the chances of not reporting biased findings. The first author has similarities to the participants in the study; therefore, it is important to recognize her positionality to avoid imposing her views on the participants’ experiences.

For the data collection phase, each researcher was trained on how to conduct semi-structured interviews using open-ended questions. Proper training on “probing” was critical to ensure the researchers did not lead participants to a particular answer. To establish trustworthiness in this study, each researcher engaged in member checks and peer debriefing to
enhance the trustworthiness of this analysis (Carspecken, 1996; Merriam, 2015). Each researcher demonstrated credibility, transferability, conformability, and authenticity throughout the study. Credibility was established through well-trained researchers who practiced proper probing in each interview to receive a detailed response. The researchers remained neutral while participants answered the questions, and results were coded directly from the transcript. To enhance transferability, the researchers described the research context and participant details. To establish conformability in this study, Dedoose coding software was used, and a trained team member reviewed codes to ensure accuracy. To guarantee authenticity, researchers described the participants’ experiences and included verbatim quotes.

One of the main limitations of this research study is the small number of participants. Specifically, within the larger study, there were only four Black women in STEM graduate programs; therefore, the researchers were only able to study four students. Conducting this research in the Midwest was another limitation. If the researchers had been able to investigate more students from several institutions nationwide under the same criteria, the results would be more robust.

Findings

The results section is divided into four case studies, one for each participant: Robin, Ruth, Cody, and Courtney. Each case study provides a detailed description of the participants, including their programs, year in the program, how they selected their advisors, if they asked other graduate students about their advisor before selection, initial relationships with their advisors, and their relationships over-time. If the participants indicated information about their undergraduate institution or undergraduate research experience, it was also included. It is vital to remember semi-structured interviews were used; therefore, the participants’ information may
vary. Although probing was used to gather as much information as possible, some participants were more talkative than others, which impacted the case study’s length.

Robin

Robin was a first-year master’s student in a biological science program at the start of the study. She completed her undergraduate degree at an HBCU and participated in undergraduate research programs. She applied to her program because it was a good research school, and her undergraduate professors told her it was a good university. Robin searched for various labs based on her research interest, but her top three were not taking students in master’s degree programs. She settled on her lab because the PI (White male) was accepting more students. She stated, “he was taking students, so that’s how I ended up joining that lab.” Robin did not mention speaking to other graduate students before selecting her advisor.

Initially, Robin felt she did not have an advisor due to the lack of guidance she received. When asked to describe her relationship with her advisor, she said, “I can honestly say I don’t think I really have an advisor.” Robin’s advisor did not assist her with picking classes; he referred her to the program director for course selection. This type of mentorship is very different from what Robin’s experience was during undergrad. Robin said,

I think a struggle I’ve had is finding good mentorship. In undergrad, and I know I’ll never get this ever again, in undergrad, I had an amazing mentor that really was interested, not only in my actual academic life but outside of academia, and really kind of motivated me and wanted to see me be successful. Now I kind of feel like I don’t have that. I don’t really have anyone that’s guiding me on how to be a successful writer in science, how to practice my critical thinking skills, or reading more articles really understanding what they’re talking about and really interpreting results.
For example, Robin was having trouble with an experiment and spoke with her PI about possible problems with the protocol. Her advisor was in denial that anything could be wrong with the protocol, but he questioned her ability to use a pipette properly. Robin was previously told and had witnessed her advisor speaking to women in a degrading manner. As Robin progressed through her program, her interactions with her advisor shifted. After working with him for a year, she stated,

My PI, though, I talk to him all the time, and we have a much better relationship than we did before. Maybe that just came with time; maybe, over the summer, I guess we spent a lot of time talking, making sure I’m on the right track.

When asked what brought about the change in their relationship, Robin mentioned,

Yeah, there wasn’t anything specific, and I think, maybe after my first committee meeting, I think he was more excited about my project, so now, I see him definitely taking more of an interest because I always felt like my project was just something on the back burner, like, ‘Hey, just do this because we need something for you to do.’

When Robin’s communication with her advisor improved, she felt he was more interested in her work. She said,

So now, he actually has an interest in it, especially when I find out something new or I have some results. He’s really excited to look at that with me, so that makes me feel a lot better. I’ve also told him about how I’m thinking Ph.D. but maybe not staying in this department, maybe going onto another department, and he’s still very supportive of that. It was nice to even hear that, ‘hey, if I don’t wanna stay here in your lab, I still wanna do Ph.D. and I go somewhere,’ and he’s willing to talk to other professors, give me, ‘This is what they’re doing in lab now,’ and all that stuff.
As her relationship with her advisor changed, she felt comfortable sharing information with him. Robin was asked if she felt comfortable sharing personal information with her advisor. She stated,

Definitely anything, I don’t know how that happened, now that I think about it. I guess over time. Yeah, so I can talk to him about anything. He asks me about my wedding all the time. I’m like, ‘Oh, I’m gonna miss your office hours at this time. I have doctor’s appointments.’ He’s like, ‘Is everything okay?’ Yeah, we definitely have a better relationship. Or Yeah, it wasn’t. I was just like, um, okay, awkward at times. Yeah, it’s gotten a lot better. I don’t know if it’s also- we have a new student in our lab who’s also in my bridge program. I talked to him a lot before he joined the lab, so I think the fact that the student was able to talk to me and then was like, ‘Yeah, I wanna join your lab,’ that he was like, ‘Oh, maybe she had something good [to] say about me.’ I don’t know.

Robin stated her research is going well. She said, “Writing, I’m pretty comfortable with that, me and my PI have been- we developed my thesis proposal within my first semester, and actually everyone else in my cohort, their PI - they didn’t start until this summer.” Robin was very pleased with the relationship shift between her and her advisor by the completion of this study.

**Ruth**

Ruth was a first-year graduate student in a biological science program at the start of this study. She completed her undergraduate degree from an HBCU, and she participated in research opportunities. Ruth completed a post-baccalaureate program at a PWI that focused on research. She applied to her current graduate program because her advisor from her post-bac program recommended it. When she interviewed for her program, the faculty were kind, friendly, and seemed invested in their students, all of which led her to select the program. Ruth’s program required students to complete three lab rotations before choosing a research lab. Although she
had to complete three, she knew she was going to select the second rotation before she started
her third rotation. Ruth was interested in working with her advisor (White female) because,
during her rotation, the PI expressed interest in working with her and enhancing her skills. Ruth
stated, “She was really interested in working with me, helping me to develop my research skills.
And that’s really what I wanted.” Ruth mentioned that she spoke to various older students in her
program about her advisor.

Ruth’s advisor has Ruth’s preferred hands-on mentoring approach. Ruth explained how
she was pleased with their interaction because they met consistently and communicated well
with one other. Ruth described her relationship with her advisor as,

Pretty well. I’ve talked to her about most decisions I’ve made so far, including
joining my lab. The whole process - going through that - she advised me on my
classes that might help me with the project I’m working on. She has a pretty open-
door policy, so if you ever need to go talk to her, she’s available. Yeah, I would
describe it as very well.

As Ruth progressed through her program, she kept the same advisor. She mentioned,
“the relationship with my mentor is about the same, I can talk to her when I need her. She’s
usually always available. We talk once a week. I don’t have a committee yet.” Ruth felt
comfortable setting up her methods and procedures, and only asking her lab manager if she had
questions. For the most part, she was able to figure out her problems using established protocols.
Although she did not attend any conferences, she published two papers. Overall, she had a
positive relationship with her advisor, appreciated her advisor’s mentoring style, and was making
satisfactory progress in her degree program.
Cody was a first-year doctoral student in a physical science program at the start of this study. Cody mentioned she participated in research opportunities during her undergraduate program. After receiving an application waiver, Cody applied to two programs at her current university and was admitted to both. Cody felt the university made her feel welcome, which was the main reason she decided to attend. She arrived on campus a few months early and researched faculty research interests. Cody selected her advisor (White female) because she was interested in her project. She stated, “so I came in June, July, and I just kind of researched online, and that’s what I was interested in, you know, I was interested in her project.”

Cody struggled and had regrets about selecting her advisor. Cody enjoyed her research, but she felt her advisor was hands-off, and she preferred a hands-on approach. Cody did not feel she was receiving the mentorship she needed from her advisor, questioned her communication skills, and wondered if staying with her advisor was the right decision. Cody stated,

Although, I just don’t think that- I think she’s a little bit busy, and don’t necessarily have the time to spend in the lab and spend with her students as much. That’s kind of not what I’m looking for, which I totally understand because I understand she has a family and she has younger kids, so that’s understandable. But I just don’t think that it’s what I need.

When applying for a National Science Foundation (NSF) graduate fellowship, she felt she did not have anyone to guide her. Although her advisor gave her a proposal she wrote, Cody felt she had to figure a lot of it out on her own. She wanted her advisor to read her proposal and provide feedback, and she did not receive that type of advising. Cody believed her advisor could do more by helping her determine a specific project. Cody struggled to decide whether this was the type of mentorship she needed. Although her fellowship allowed her to switch labs, she was
frustrated because there were a lot of uncertainties about how changing advisors would affect her time to degree and the possible harm to her relationship with her current advisor. She was afraid to speak with other faculty members in the department because she did not know who was friendly with her current advisor. She reached out to a professor, and he agreed to mentor her; both Cody and the new professor were excited.

As time progressed, Cody identified traits she did like about her advisor: a woman in physical sciences, a direct person, business-oriented, and knowledgeable about writing grants and proposals. Cody noticed, over time, that her thoughts about her advisor giving her a project shifted. Cody mentioned, “she may not necessarily have a project for me, and I kind of have to think of a project myself, and so it’s almost like I just discovered this over the past few weeks or so.” She also learned how to communicate more effectively with her advisor. Cody felt she had to initiate meetings more often now that she is starting her research project. Cody was awarded the NSF fellowship the second time she applied and stated her advisor helped her a lot. After receiving the fellowship, she mentioned that she was writing a publication with her advisor.

She said she was starting to trust her advisor more because she gave her a month to do her prelims, and Cody felt she was not prepared but told her she would be fine; Cody passed her prelims. Cody’s advisor shared personal experiences with her about being a woman in STEM, and that too strengthened Cody’s trust in her advisor. Cody said, “so our relationship is a little closer than what it was last year this time.” She was also pleased that her advisor assisted with two collaborating research projects from two different universities. Although Cody’s relationship with her advisor was stronger, she felt her advisor was helpful with general research in the field but was not as knowledgeable about specific science techniques and protocols because she was not as involved in the project. Cody spoke with other faculty members within
the department to develop research questions and suggestions about experiments. When Cody talked to her advisor about possibly leaving the group, her advisor suggested a co-advisor, and Cody agreed.

_Courtney_

Courtney was a second-year doctoral student in a physical science program at the start of the study. She participated in a joint program during undergrad and received a joint degree; one university was an HBCU and the other was a PWI. She participated in summer research for three summers at another institution with the same PI each year. Courtney selected her university because it was one of only a few with her program. Courtney met her advisor when she participated in a weekend visit. She picked her advisor (White female) because she felt they connected, and she had funding available. She later said, “I felt like we really connected, and I was like, ‘oh I could see myself working with this person,’ but she didn’t have funding, so I kind of scratched it out.” The following week Courtney’s advisor reached out to inform her that she had funding, and Courtney decided to attend that university. Courtney asked graduate students at her weekend visit about her advisor, but they did not know much about her.

After selecting her advisor, Courtney was not pleased. When Courtney arrived on campus, everything was different from what she expected. Initially, her advisor gave her the impression that she did not have any students because she was just returning from sabbatical, which was incorrect. Courtney was asked to manage three to four undergraduate students while taking two classes and fulfilling research responsibilities. Courtney felt her advisor was not understanding and overloaded her with too many tasks, leaving her unable to focus on her studies. Due to the lack of study time, Courtney failed her midterms. During the summer,
Courtney stated she was always in the lab and was only allowed to leave during her exam. Then her advisor suggested she drop a few courses because she received a “B” in the class when she failed the midterm. Courtney stated, “I ended up getting a B out of the class, and she told me my grades were ‘shitty’ and that I’d be asked to leave the department most likely if I didn’t bring them up.” After Courtney failed her midterm and was overworked by her advisor, she worked up enough courage to say no to tasks that were impossible to complete. At this point, she said her advisor started using a condescending, nasty tone with her. Courtney stated she had an awful experience with her advisor.

As time progressed, Courtney’s relationship with her advisor did not improve. She mentioned that although she worked closely with a White male master’s student, her advisor would not question his work but would always question her work. Courtney said, “Whenever I presented something, it was always, ‘are you sure you did it right?’ and you know, very condescending things like that.” Courtney also reported that,

She made comments that, was like well, I know she was like, ‘originally I thought you were lazy and that you couldn’t do anything’ or something like that and I said, ‘well, what have I ever done to give you that opinion’ and she got {inaudible}… so she got quiet, and she was like, ‘yeah, you’re right, you’re right, but that’s not my opinion of you anymore so don’t worry about that.

During the same meeting, Courtney asked her advisor the next step to the research for their project because they had been harping on one thing for two months. Her advisor got upset because she felt like Courtney was questioning her authority and saying her work was not good.
Once Courtney decided she wanted to switch advisors, she did not say anything because she wanted to get a publication out of the work she had completed. Courtney felt her advisor tried to intimidate her into dropping out of the program, and her advisor accused her of harassment, saying she kept sending her emails. However, Courtney said the advisor was sending the emails and cc’d the chair and academic advisor; therefore, they knew it was the advisor. Courtney felt the department was supportive of her decision to switch advisors. Her advisor was restricted from getting new graduate students for two years. Courtney changed her advisor because she said, “she was the advisor from hell.”

Cross-case Summary

In summary, participants selected their advisors for various reasons: availability, research interest, funding, and advisor’s interest in working with a student. Although there is no universal method for selecting an advisor, it is evident personality and advising styles were considered prior to selecting. One out of four participants were in a program that required lab rotations, which can greatly benefit students as they decide which lab to join. The student was able to get a feel for the advisors’ advising style, research topic, and research group environment. Also, each of the participant’s relationships with their advisor changed over time. Of the four, three participants’ relationship improved over the 18 months of this study. The advisor selection process mattered for these four Black women. Participants who preferred their advisors’ advising style were able to publish, received fellowships, and progressed in their program. However, the participant who did not prefer her advisor’s advising style suffered emotional trauma and eventually switched advisors.
Discussion

The goal of the current study was to understand how and why Black women STEM graduate students selected their advisors and explore their perceptions of their relationship with their advisors through the first portion of their graduate program. This study adds to the literature that explores Black women’s experiences in higher education using a BFT framework. BFT was employed to further deconstruct the advisor-advisee relationship from the students’ perspective and interrogate the power dynamics from multiple perspectives including position within the university, race, and gender identity. Although the participants in this study were enrolled in different programs with unique characteristics, their collective experiences as Black women graduate students in STEM offered shared perspectives on the advisor-advisee relationship. Our findings support previous research that suggests the advisor selection process is critical (Zhao et al., 2007), and the advisor-advisee relationship impacts Black women in graduate programs to a greater degree than students with other identities (Patton & Harper, 2003; Patton, 2009).

Participants in this study chose their advisors for various reasons: personality compatibility, lab availability, research interest, funding, and faculty interest in working with a student. The results indicated the students have both negative and positive reasons for selecting their advisor. Cody selected her advisor based on her research interest. Having an advisor that was knowledgeable with a network within her area of research was essential to Cody. Although her advisor had the traits she initially preferred, she struggled with her advisor’s advising style. Although our findings supported Barres (2013) study that indicated selecting advisors solely on research area is not in the student’s best interest, Cody balanced selecting an advisor that was knowledgeable about her field, which could positively impact her long-term productivity and
success (Williamson & Cable 2003) with the shorter term struggle with the mentor’s style of advising.

Ruth’s department required her to complete three lab rotations before selecting an advisor. During Ruth’s rotations, she was able to get a feel for the advisor, research group, and research topic. Specifically, she had the opportunity to spend time in three different labs to see which would best fit her. After selecting an advisor from her rotations, she published two papers. This finding supports other research highlighting the importance of selecting a research advisor rather than being assigned to one (Welde & Laursen, 2008). We contribute to and extend research indicating that students who participate in lab rotation are exposed to different research topics and environments (Hall, 2006; Golde, 2007), develop new skills and knowledge (Austin & McDaniels, 2006), and gain access to research funding and publications (Gopaul, 2016).

Finding a good match and selecting a research advisor proved difficult for the students in the sample as the students viewed this process as taking a chance on their future success, productivity, and mental health when selecting their advisor. Three out of the four participants are first-generation college students who had limited knowledge of the graduate education process. Gardner and Holley (2011) found that first-generation college students and minorities (Posselt & Grodsky, 2017) in Ph.D. programs reported experiences of social disconnect that negatively impacted their ability to access and benefit from social and cultural capital within their academic institutions. The socialization mechanism is beneficial for students, Gardner (2007) as peers can provide new students with insider information on labs within a program. In our study, participants benefited from asking other graduate students about their advisors before selecting. However, the participants may not have asked the right questions when seeking what they considered a “good” advisor and some were unable to get their questions answered. Given
the unique experiences of these participants, their identities as Black women, their questions may have been best answered by other Black women who are familiar with their double oppression and unique positionality (Collins, 2002; Patton & Harper, 2003). Given the low representation of Black women in STEM graduate programs and low representation of Black female STEM faculty at a PWI, finding peers or mentors to seek advice from is challenging and poses yet another hurdle for underrepresented students. Still, Ruth’s positivity experience of selecting an advisor through rotating through three labs, confirmed earlier studies including Golde’s (2005, p.687) “science advising relationships were best made when the student knew both the advisor’s research interests and supervisory styles, a finding confirmed by other researchers.

The advisor’s role is critical for students in STEM fields, and many students, especially women, prefer for advisors to be supportive and present; (Lovitts, 2002; Welde & Laursen, 2008). The preferred advising style for participants in this study was a hands-on approach. The participants continuously mentioned the desire to have an advisor that would assist with developing research questions, provide feedback on writing, be available to meet consistently, be engaged with developing lab skills, help with publications, and expand the participants’ network. When participants received support academically from their advisors, it was beneficial, which echoes findings from Weldea and Laursen (2008). According to Rasheem et al. (2018), when mentors provide Black women with various resources and support, it promotes their success. The participants preferred advisors who displayed these traits, while advisors who demonstrated a hands-off approach were not preferred.

According to Esposito et al. (2017), when mentors do not provide students with knowledge or helpful tips, it speaks to a hidden curriculum of the academy which deprives Black students of the opportunity to gain insider knowledge. In this study, participants’ experienced
mentors who advised using a “hands-off approach,” which consisted of not assisting in developing research questions, being unavailable to meet consistently, not providing feedback on writing, not replying to emails in a timely manner, not helping with the development of lab skills, and not assisting with publications. A “hand-off approach” is a disadvantage to Black women in graduate programs who have limited access to support with research (Spranggins, 1998) to the hidden curriculum and to adequate advisor support. Although Katz and Harnett (1976) implied negative experiences are part of the graduate student experience, Black women have a higher chance of being racialized and gendered (Seo & Hinton, 2009), which amplifies and exacerbates negative experiences and ultimately may result in students dropping out (Walkington, 2017).

Black women have reported feeling second-guessed in all spaces, including higher education, because of their race and gender (Collins, 2002). Cody stated that she worked closely with a white man in her lab, and although they checked each other’s work, her advisor often questioned her work specifically. Unfortunately, Cody stated her advisor had developed a reputation for challenging the work of women. This experience of being second-guess by her advisor supports Noy and Ray (2012) who found that students of color consistently reported that their primary advisor was less respectful of their ideas compared to ideas of their white peers. A similar incident happened to Robin; when she joined her lab, her advisor questioned if she knew how to use a pipette because he did not believe the protocol was wrong. Spraggins (1998) indicated faculty assume Black students are affirmative action recipients and are underprepared for graduate-level work. Courtney’s advisor overworked her and spoke to her in a condescending tone if she was unable to do something for her. Higher education in America has served the needs and interests of White men since its inception while Black women have
struggled to be present and heard, which is echoed in the participants’ stories and supported by several scholars (Alexander & Bodenhorn, 2015; Collins, 1986; Collins & Bilge, 2016; Crenshaw, 1989; Thomas & Hollenshead, 2001; Patton & Harper, 2003; Walkington, 2017).

Time was a significant factor and concern for the participants in this study. It was expressed several times by participants that more time was expected from their advisors. Students who spent more time with their advisors developed better communication skills, felt more comfortable in the lab, and were able to publish. Ruth had a regular meeting once a week with her advisor and mentioned her advisor was available more if needed. Ruth was pleased with the relationship she had with her advisor, was comfortable with lab research, and published two articles. These findings supported Barnes et al. (2010) findings that students prefer an advisor to be accessible and helpful. Like, Griffin et al. (2018), our finding illustrates accessible advisors are beneficial to the personal and professional growth of minority students in STEM. Cody felt her advisor was busy and did not have the time to provide her with hands-on guidance. For instance, the first time Cody applied for an NSF fellowship, her advisor gave her an example of a proposal she wrote but did not provide her with written feedback because she was traveling. Cody was not awarded the fellowship the first time she applied. The second time Cody applied, she had significant help from her advisor, and she was awarded the fellowship. When advisors are not accessible, students tend not to prefer their advisors’ styles (Barnes et al., 2010) and ultimately suffer from a lack of guidance (Fuhrmann et al., 2011; Golde, 2005; Welde & Laursen, 2008).

Additionally, the duration of the relationship with their advisors mattered for some participants. Cody and Robin initially did not prefer their advisors’ advising styles but adjusted to their advisors’ advising styles over time. When Cody mentioned to her advisor about leaving
the group, her advisor suggested a co-advisor, and Cody agreed. As time went on, Cody said she began to trust her advisor, which was important to her. Robin initially felt she did not have an advisor, and as time progressed, she was so close to her advisor that they discussed personal topics such as her wedding. Robin mentioned she was not sure why or how her relationship with her advisor changed; time was the only factor that could be considered. While Schlosser et al. (2003) reported the advisor-advisee relationship changes over time for counseling psychology students, our study adds to the literature that the advisor-advisee relationship can change over time for Black women in STEM graduate programs. Also, Cody’s advisor suggesting a second advisor supports Noy and Ray (2012), who found that women doctoral students search for a secondary advisor who takes an interest in their personal lives and connects to their well-being.

Switching advisors was a significant concern for the participants who did not prefer their advisors’ advising style. The participants feared the possible political backlash of switching, gaining a bad reputation, not being able to find another advisor, losing funding, and other concerns. Also, when students switch advisors, they often have to change research topics, adjust to a new lab, and develop a relationship with another faculty member, all of which puts them at risk for delaying degree completion. Both Cody and Courtney stated that they wanted to switch advisors but were uncertain of the risk they would be taking. Cody did not want to risk losing the opportunity to apply for an NSF fellowship and publish a paper. Courtney did not want her year of research to go to waste; she felt she would be listed as an author on forthcoming publications if she were to leave. Both students feared the possible backlash of switching and having a bad reputation and facing the possibility that other faculty members may be persuaded to avoid working with them. Based on the findings, the participants did not feel comfortable with switching advisors and had little guidance with the process. Despite this, Courtney’s
relationship with her advisor was so fraught that she eventually changed advisors and labs. Because switching advisors is such a public event, the fear of reprisal was embedded in their decision. Our findings align with Lunsford and Baker (2016) who found that switching advisors can be difficult for students. Maher et al. (2020) found students who switched advisors in their second year were more likely to leave the program with a master’s degree rather than complete the doctoral degree. Research has shown that “the rotation process” helps to mitigate some advising switching problems in the sciences (Golde, 2005) and that it is best to switch advisors in the first year of the doctoral program (Golde, 2005; Maher et al., 2019).

**Conclusions**

Drawing on the interviews from four Black women doctoral STEM students at a PWI in the Midwest, this research endeavored to share these women’s stories about their experience with selecting an advisor and the relationship that evolved over time. This study indicated that selecting an advisor who can serve as a mentor and positively guide students through their degree program is critical for the success, productivity, and well-being of Black women in STEM graduate programs. At the onset of their graduate experience, the participants did not understand which characteristics and advising styles were needed for them to complete their program before selecting their advisors, which made developing a productive advisor-advisee relationship difficult in some cases. Selecting an advisor varied based on each participant’s needs, but it was clear that the advisor selected had an impact on Black women as they progressed through their graduate programs. Black women who had an advisor they considered a good match or developed a supportive relationship with performed better in their courses and labs. Since research is a critical component for a graduate program, especially in a STEM program, and this study took place at research-focused institutions, students emphasized their
research experiences with their advisors in the lab. Additionally, participants in this study who felt that they received the time they felt was needed with their advisor preferred their advisors’ advising style, while those who did not receive enough time did not prefer their advisors’ advising style. The participants made it clear that the amount of time spent with their advisor impacted their relationship. Since each participant identified time with the advisor as a need, Black women in STEM graduate programs may need more advising and guidance from research advisors compared to students from non-marginalized groups.

The implicit nature and hidden curriculum of graduate school is compounded by the double bind Black women face due to bias against both their race and gender. This small demographic is at a disadvantage and is especially problematic in STEM graduate programs where the majority of faculty are White men. This underrepresentation leads to skewed power dynamics. In this study, the advisors were White men or women in both powerful and priviledge in society and in academia, and the advisees were Black women with limited power in society and academia. In graduate programs, the advisor has the power to grant or deny the advisee access to academia. For Black women working with White men or women advisors, the power dynamic between advisor and advisee is racialized and, in some cases, gendered. This social arrangement furthers the imbalance of power and can make establishing an open and positive relationship challenging. It is imperative that advisors recognize their implicit biases and actively work to overcome them.

Although this study explored Black women in graduate STEM programs at predominantly White institutions, the findings may be beneficial for the graduate student population as a whole. Based on the information provided, it may be in the best interest of all students if departments provided a workshop or seminar on selecting an advisor. Providing
resources on selecting an advisor may provide students, specifically first-generation and minority students, with valuable information to consider before deciding which research lab to join. Additionally, requiring lab rotations may be helpful for graduate students in finding a good fit with the advisor and other students in the research lab as it allows them to acclimate to the lab, PI, and peers within the lab before making a permanent decision. If departments implement lab rotations, it could significantly increase students’ opportunities to select a lab with an advisor whose advising style best matches their personality and educational needs. Additionally, it may be beneficial for students if advisors ask them about their needs, such as whether a hands-on or hands-off approach fits their personality best. Having simple conversations may allow students to feel comfortable communicating with their advisors, which may increase the chances of staying with their advisor and ultimately complete their program and degree.

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CHAPTER III

BLACK AND LATINO/A/X STEM GRADUATE STUDENTS PERCEPTION OF THE ADVISOR/ADVISEE RELATIONSHIP OVER TIME

Abstract

It has been reported that the advisor-advisee relationship can evolve over time (Schlosser, 2003). This study will explore how the advisor-advisee relationship evolves over time and which characteristics influence the change among Black and Latino/a/x STEM graduate students’. Critical Race Theory (CRT) was used to explore Black and Latino/a/x experiences at Predominately White Institutions as it provides an in-depth understanding of the issues in postsecondary settings (Patton, 2006). Using a qualitative research approach, data was collected through six individual semi-structured interviews over three years with each participant. The interviews were audio-recorded, transcribed, and analyzed with emergent coding. This study’s data emerged from a larger study focusing on the experiences of underrepresented minority students enrolled in STEM/SBE graduate programs at three Predominantly White Institutions in the Midwest. Purposeful sampling was used from this larger population to identify 19 Black and Latino/a/x in STEM graduate programs for a more in-depth analysis. The findings suggested majority of participants in this study reported their relationship with their advisors changed over time. Three reoccurring themes influenced the change as the advisor-advisee relationship developed: accessibility, time, trust, and communication.
Introduction

Across graduate education programs, an average of fifty percent of enrolling students will leave before completing their degrees (Golde, 2005; Lovitts, 2002; Nettles & Millet, 2006), and the attrition rate is even higher in STEM programs (Griffith, 2010; Hill et al., 2010). Among underrepresented minority populations, the attrition rate is higher in graduate programs across all disciplines and higher than their white peers (Council of Graduate School, 2004). Although graduate school is challenging for most students, Charleston et al. (2014) suggest that underrepresented graduate students tend to experience a unique set of challenges while navigating through their programs.

Many scholars agree that one of the critical components of all students’ graduate school experience is the advisor-advisee relationship. The advisor-advisee relationship is a critical component of the graduate student’s experience (Golde, 2005; Lovitts, 2002; Scholsser & Gelso, 2001; 2005) in that graduate advisors may significantly influence graduate students’ personal and professional growth (Scholsser & Gelso, 2001; Scholsser et al., 2003; 2005; Scholsser et al., 2011). Several scholars reported the advisor-advisee relationship for the graduate student experience is critical (Bloom et al., 2007; Scholsser et al., 2011; Wrench & Punyanunt, 2004). Having the right advisor could lead to greater satisfaction and a faster completion rate (deValer, 2001), while having the wrong advisor could lead to leaving the academy without a degree (Lovitts, 2002). Typically, this interpersonal relationship is built on the apprenticeship model, where the advisor is the master, and the student is the apprentice. Traditionally in STEM disciplines, graduate students experience a dyadic advisor-advisee supervision model whereby advisors shepherd their advisees through research requirements and serve in other capacities (Scholsser et al., 2003).
Because of a lack of diversity among graduate faculty who serve as potential advisors, the advisor-advisee relationship is even more crucial for under-represented minority (URM) students (Jones et al., 2013). Many URM students struggle to build relationships with faculty (Brown et al., 1999), yet identifying a faculty advisor early is essential for STEM students because it positively impacts their trajectory (Creighton et al., 2010; Tillman, 2001).

Specifically, in STEM programs, advisors are typically heavily involved in their research which is often funded by outside agencies such as NSF, NIH, or DoD. Graduate students are generally funded, tuition and stipend, in exchange for conducting research on these funded projects or, alternatively, serving as teaching assistants in undergraduate STEM courses. This education and funding model inherently sets up a dynamic whereby student funding is tied to a research advisor or teaching supervisor. To complete the research portion of their degree, STEM graduate students must join a lab and have a research advisor before selecting a dissertation topic. If URM students have their own funding, which is often the case due to diversity-related funding opportunities, and struggle to build relationships with non-URM faculty, selecting an advisor becomes more difficult. Not building relationships within the first year of their program could cause URM graduate students to take longer to finish or result in them leaving the program (Millet & Nettles, 2006).

For this paper, the term *advisor-advisee* is defined as the relationship between the research advisor and graduate student. The advising relationship is not unique to STEM students in graduate programs, yet there are many aspects of the STEM advisor-advisee relationship and STEM graduate education that set it apart from other fields and continue to pose additional challenges for URM-identifying students. One area in particular that is poorly understood, is how the relationship between advisor and advisee develops over time. The longitudinal study
presented here aims to investigate the advisor-advisee relationships from the perspective of Black and Latino/a/x graduate students in STEM programs. Specifically, the study will explore the relationship between students and their advisors over time and the perceived factors contributing to relationship changes.

**Related-Literature**

Researchers agree that the advisor-advisee relationship impacts graduate students’ success (Barnes & Austin, 2009; Bloom et al., 2007; Liu et al., 2018; Liu et al., 2019). Studies on the advisor-advisee relationship have focused on it from both the student’s perspective (Patton, 2009; Noy & Ray, 2012; Welde & Laursen, 2008) and the advisor’s perspective (Baker & Griffin, 2010; Griffin et al., 2010), with both perspectives showing that mentoring was important to the advisees’ success. Lunsford (2012) investigated how advisors influence doctoral advisees’ outcomes from the students’ perspective. The study reported that advisors’ mentoring was connected to student outcomes; good mentoring produced positive outcomes and bad mentoring suggested negative outcomes. Griffin et al. (2010) explored how mentors support students to succeed in STEM. The finding was consistent with other studies (Griffin et al., 2018; Prime et al., 2015; Rasheem et al., 2018; Reddick, 2012) that reported mentoring is beneficial to student development.

A productive relationship between the advisor and advisee is essential to a graduate student’s overall experience. Students who receive mentoring from their advisors have a higher productivity rate (Paglis et al., 2006). Several studies found that graduate students are very capable of describing and identifying the characteristics of what they wanted or did not want in an advisor (Alexander & Bodenhorn, 2015; Felder, 2010; Patton, 2009; Rasheem et al., 2018; Scandura & Williams, 2001). Focusing on Black women in the academy, Rutledge et al. (2011)
explored factors affecting students’ satisfaction with the advising relationship. Their results indicated female graduate students wanted their advisors to display supportiveness, a high level of interaction, provide regular reviews of progress, and treat the students as junior colleagues.

Similarly, Barnes et al. (2010) conducted a study on the advisor-advisee relationship. He reported that students spoke most positively about advisors who were accessible, helpful, social, and caring. Conversely, they identified being inaccessible, unhelpful, and uninterested as negative attributes of advisors. Schlosser et al. (2003) interviewed sixteen third year counseling psychology doctoral students’ perceptions of their relationship with their advisor. Students who were satisfied with their advisors reported their advisors were supportive, friendly, collegial, respectful, and met with them regularly. Conversely, unsatisfied students said their advisors were cold, distant, shallow, and businesslike. Additionally, the findings suggested that students satisfied with their advisor-advisee relationship reported their relationship became more positive over time and that they grew closer to their advisor, while unsatisfied students said they became more distant and their relationship worsened over time. While Schlosser et al. (2003) reported the advisor-advisee relationship change over time for counseling psychology students, it is unknown if STEM graduate students’ relationships with their advisors changes over time.

**Impact of the Advisor-Advisee Relationship in STEM Disciplines**

Mentoring relationships between faculty and students are particularly important for graduate students (Davidson & Foster-Johnson, 2001), especially for underrepresented and minoritized students (Griffin et al., 2010; Brown et al., 1999). Nettles and Millett (2006) found that STEM faculty-student interactions occur at a higher rate than in the humanities and social sciences. Graduate students tend to complete their degrees at higher rates in programs where
faculty are supportive and provide students with guidance and intellectual stimulation (Gardner, 2008; Golde, 2005). For students in the sciences, caring advisors may assist students with various challenges and serve as role models and mentors (Barnes & Austin, 2009). Although several scholars have reported the importance of graduate students identifying an advisor (Brown et al., 1999; Griffin et al., 2011), it is common for graduate students from underrepresented groups tend to struggle finding suitable mentors with similar backgrounds that can provide adequate academic and social support (Patton & Harper, 2003).

Meaningful relationships with faculty are essential to minority graduate students because it is a predicting factor for program completions (Brooms & Davis, 2017; Esposito et al., 2017 Patel, 2017). According to Griffin et al. (2010), graduate students appreciated when their advisors pushed and nudged them to network, ask questions, and explore research opportunities. Welde and Laursen (2008) found that advisors’ roles can fall into three categories: disciplinary and departmental mooring, career advisor, and mentor. If the advisor fit into all three categories, the advisor was considered the “ideal type advisor.” The “ideal type advisor” supported, respected, and listened to their advisee, offered guidance and set high standards, and contributed to the development of confident, knowledgeable, and well-connected STEM professionals.

Golde (2005) explored the role of the department and discipline in doctoral student attrition. Findings revealed that incompatible advising relationships, marked by a lack of interaction, trust, and intellectual support, were the cause of much of the attrition in science departments. Given that the advising relationship is a critical and central component of science doctoral education, the student’s education is severely impacted when the advising relationship deteriorates. The study also indicated that the process of switching advisors and groups/labs was
a public one, and students were concerned about the message that the decision may send to faculty or possibly a future advisor.

Many scholars who conduct advisor-advisee relationship research focus on graduate students in humanities and social sciences rather than STEM (Barnes et al., 2010; Schlosser et al., 2003; Schlosser & Gelso, 2001, 2005; Schlosser et al., 2011; Wrench & Punyanunt-Carter, 2005). Although some advisor-advisee issues may be similar across disciplines, STEM programs are structured differently. Because STEM graduate programs involve research at the graduate experience’s outset, selecting the right lab with the appropriate advisor sets up the student’s graduate career from the start. Moreover, the bulk of this cross-sectional research that centers on the advisor-advisee relationship describes the nature of the relationship as static in nature rather than a dynamic relationship that can change over time. Given the length of time that it takes to complete a Ph.D., it is possible that not only could the student change advisors over time, but that the relationship itself can change over time. Because the advisor-advisee literature on the STEM population is limited and is even more sparse when it comes to Black and Latino/a/x doctoral advisees, this research addresses how advisor-advisee relationships may influence STEM minority graduate students’ experiences in graduate school, specifically how the relationships evolve over-time. The guiding research questions are as follows:

1. How do Black and Latino/a/x STEM graduate students describe their relationship with their advisors over time?

2. Which factors contribute to changes in the advisor-advisee relationship?
Framework

Critical Race Theory (CRT) is the framework used in this study to understand the relationships between minority STEM graduate students’ and their advisors over time. CRT allows researchers to analyze the role of race and racism in perpetuating social disparities between dominant and marginalized racial groups. According to Hiraldo (2010), CRT contributes to inclusivity and diversity in higher education through criticisms of the structure and history of academia. Specifically, CRT is critical to understanding research that focuses on minority populations in predominantly white institutions (Hiraldo, 2010). CRT also provides a voice to people who have been systematically oppressed (DeCuir & Dixson, 2004) and can be used to uncover the ingrained societal disparities that support a system that promotes privilege and oppression.

CRT’s framework comprises five tenets: counter-storytelling, the permanence of racism; Whiteness as property; interest conversion; and the critique of liberalism (DeCuir & Dixson, 2004; Ladson-Billings, 1998; McCoy, 2006). CRT has several tenets that were central to the design of this study: (a) allows students to have a voice in higher education settings, (b) explores issues of equity and access in the field of education, (c) focuses on race and policies in education, (d) analyzes different types of data to address inequity and injustice in education, and (e) aims to root out systemic inequalities by including history. CRT highlights how racism exists in higher education and the impacts it has on the educational system.

Through a CRT lens, we can better understand the experiences of underrepresented populations. Due to the structure of class and racism in the U.S., hard work alone is insufficient for marginalized groups to succeed within higher education because the system and curriculum in higher education are designed around White experiences (Patton, 2016). Furthermore, the
White men who were educated at these systematically racialized institutions make up most faculty and higher administration positions. Patton et al. (2007) suggests that higher education should incorporate CRT perspectives in daily practices within education. Patton (2016) indicated that CRT is critical in higher education because it gives underrepresented groups an option to share their experiences in predominantly white spaces. CRT allows marginalized groups to express their voices authentically and will enable researchers to analyze these experiences in-depth and develop new understandings of the student experience from a diverse and inclusive perspective (Giles, 2010).

Methods

This research’s data stems from a more extensive mixed-methods study focused on identity integration for URM STEM or Social, Behavior, and Economic Sciences (SBE) graduate students as they assimilated into a disciplinary community of practice (NSF AGEP: BPR Grant #1309055). A longitudinal approach was used to develop an in-depth understanding of factors critical for URM students’ retention and their transition into their professional communities. Semi-structured interviews, Likert-scale surveys, and social networking surveys were administered over three years to collect data on 34 Black and Latino/a/x STEM or SBE graduate students’ experiences. For the study described here, we explored how the advising relationships between advisors and STEM advisees changed over time and what factors contribute to these changes.

A multi-site case study approach was utilized to capture a diverse range of experiences (Merriam, 2009). The research site took place at three primarily white institutions located in the Midwest region of the United States. Although three institutions were included in the larger study, one institution with a small graduate population did not have any participating STEM
students. Due to the broader study focusing on STEM and SBE graduate students, purposeful sampling was used to select only STEM students. This study’s participants consist of 19 minorities (Black/African American, Hispanic/Latino/a, biracial) which consisted of 11 women and 8 men, enrolled in STEM programs at one of the two PWIs in the Midwest.

The PI accessed students for recruitment through each institutions’ registrar’s office. The Human Subject Institution Review Board (HSIRB)-approved recruitment email was sent to all students meeting the selection criteria: underrepresented minority, first- or second-year graduate student, STEM or SBE program (as identified by the PI utilizing the graduate catalog). Students were invited to complete a pre-survey after consenting to participate. The pre-survey included demographic information, identity scales, and social support scales. After the survey, participants were given the option to provide their contact information in an unlinked online form to indicate interest in the study’s interview portion. All students who expressed interest in participating in the study were contacted, and interviews were scheduled. Over three years, each participant completed six individual semi-structured interviews conducted by one of the five research team members.

The semi-structured interviews were scheduled approximately every six months over a 3-year period from June 2015 to December 2017. Most interviews were conducted in-person, on-campus or near the university campuses at a location of the participants’ choosing by one of five trained researchers. Each researcher followed the same semi-structured interview protocol but probed according to the responses given by the interviewee. Interviews were conducted by video conference if participants were unable to meet in person. During all six interviews, participants were asked to describe their relationships with their advisors. The interview length varied depending on how much information was provided, ranging from 30 to 154 minutes.
Interviews were audio-recorded and professionally transcribed. Interviews were read several times prior to codes being created. The codes were created based upon the responses, not questions. It is important to note; participants used the terms mentor, PI, and advisor interchangeably; however, both were used to describe the relationship between the research advisor and graduate students. As illustrated in table 1, the codebook generated by the research team included the name of the code, definition, and an example to clarify the code’s meaning. The following codes, good match, mismatch, neutral, and change in advising style, allowed the researchers to track changes with the advisor-advisee relationship as participants progressed through their program. To ensure intercoder agreement amongst group members, the codes and definitions were created and revised several times to increase consistent usage. Each transcript was coded multiple times to improve accuracy. Each participant was assigned a pseudonym to protect their identities. Additionally, identifying characteristics were removed from the transcripts before uploading to Dedoose, a software program for managing and coding qualitative data. Two trained coders analyzed each interview and met to discuss findings to limit bias and ensure intercoder agreement was met.
### Table 1

*Codes, Definition, and Examples*

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Match</td>
<td>Describing she likes the advising style of the advisor and why.</td>
<td>My advisor is extremely helpful when it comes to writing proposals. We just found some back-and-forth because I have, I don’t know, eight versions of it stored on my computer. Which the first version is awful then to the last. (CAROLINE)</td>
</tr>
<tr>
<td>Mismatch</td>
<td>Describing she does not like the advising style of the advisor and why.</td>
<td>I think that my advisor in particular could do more to kind of ensure that her students are – because I’m in a situation where I’m in a research group, but I think my advisor could be more helpful in helping me determine a specific project…. That’s been my toughest challenge so far, is deciding whether this is the type of mentorship I need. (RUTH)</td>
</tr>
<tr>
<td>Neutral</td>
<td>Describing she has no change or the statement is not like/dislike as it pertains to the advisor relationship.</td>
<td>“I mean it hasn’t changed much, my relationship with my advisor, how I see her” (CODY).</td>
</tr>
<tr>
<td>Change in advising</td>
<td>When participants describe how their advisor’s advising styles have changed.</td>
<td>“I feel a lot more comfortable around him, and a lot more confident. I feel like he trusts me more, which I don’t know if it’s a good or a bad thing. Yeah, I think that’s all I can say, really (SCOTT).</td>
</tr>
</tbody>
</table>
Reflexivity describes self-examination on the role of subjectivity in the research process. It is a continuous process of reflection by researchers on their values (Rolfe, 2006). Qualitative research is known to have a constant process of reflection on the data and how the researcher interacts with and understands it (Creswell, 2009). In this case, the researchers are a Black woman graduate student in a STEM field, similar to the study participants, and a White woman STEM faculty member. Both researchers were properly trained on how to conduct semi-structured interviews prior to interacting with the participants. Qualitative interviewers mainly seek to understand; it is essential to the study that the researcher remains neutral during the interview when participants are responding and focuses on clarifying participants’ experiences and perspectives.

The researcher engaged in member check and peer debriefing to enhance the trustworthiness of this analysis (Carspecken, 1996; Marshall & Rossman, 2011; Merriam, 2009). In member checking, we verified participants’ responses to ensure that we understood the message they intended to deliver. This also allowed for collaborative meaning-making and verification that the researchers’ analyses accurately represented the participants’ experiences and perceptions. When debriefing, our research team analyzed transcripts individually before having open discussions as a team. We also coded the transcripts before discussing our thoughts to limit possible influence from other members of the research team (Carspecken, 1996).

When the codebook was generated, definitions and examples were included to improve consistency and reliability across members of the research team. The codebook was created and tested to ensure each researcher’s consistent use of the codes (Ryan & Bernard, 2000). When we disagreed on the code that was applied, we had detailed discussions to try to understand the
perspectives of other team members and to come to consensus about how to apply the codes. The codebook was revised, definitions were modified, and discussions continued until agreement was reached and each team member felt comfortable applying the codes consistently.

**Limitations**

Although representative of the larger issue of low enrollment in STEM graduate programs by Black and Latino/a/x students, the small number of participants in this study is a limitation. The findings cannot be generalizable to the larger population of Black and Latino/a/x graduate students in enrolled in U.S. PWI institutions. Although longitudinal in nature, the study did not capture the full graduate experience for students. Some students began the study in their second year, thus the initial interaction with their advisor was not discussed as much. Conversely, students who started in their first year did not reach the end of their program by the sixth interview. A better understanding of the advisor-advisee relationship could be achieved with a study spanning four to six years. Additionally, this research was geographically restricted and only conducted in the Midwest. While this likely highlighted racial disparities and challenges that would not be as pronounced in more diverse locations, it does limit the robustness of the data. The use of robust qualitative data and diverse participant voices, however, lends an authenticity and relatability to the work presented here that is likely relatable to both faculty and students within STEM graduate programs.

**Findings**

This study aimed to use CRT to interpret Black and Latino/a students’ experiences in STEM graduate programs. The findings elevate the lived experiences through narratives, which is critical because research rarely uses historically oppressed people’s voices. The following
section will show the impact of the relationship between the advisors and advisees for Black and Latino/a/x students in STEM graduate programs. Majority of the participants reported their relationship with their advisor changed over-time. For some participants, the relationship changed for the better, and for others, the relationship remained the same or changed for the worse. The findings section will be divided into three recurring themes: accessibility, trust, and communication. These recurring themes led the advisor-advisee relationship to strengthen, and in some cases weaken, over time.

**Theme 1: Accessibility**

Black and Latino/a/x students reported accessibility was a significant factor that contributed to the advisor-advisee relationship over time. Advisors who were perceived as “accessible” were viewed as helpful and supportive as the relationship progressed. Participants repeatedly stated that they appreciated when their advisor had an open-door policy, responded to emails, and was available to answer questions. Additionally, participants who had standard meetings implied their advisors demonstrated compassion with them. From a CRT perspective, an accessible advisor may be needed because minority Black and Latino/a/x participants lack the social capital that their peers may benefit from. Participants also felt more comfortable discussing scientific ideas when they met with their advisors consistently. Participants reported when advisors were accessible; they spent more time with their advisors, which influenced their relationship for better or worse over time. Participants who spent time with their advisors got to know them personally, which influenced the development of their relationship. Participants who spent time with their advisors were also able to take criticism and acknowledge their flaws.
For instance, in interview one, Adamari, a Hispanic woman, described her relationship with her advisor, she said,

It’s very professional. I see him whenever I want. He has an open-door policy. I can just walk in whenever. I can send him an email and he’ll reply right away. He’s always here. But he’s never monitoring me, or never over my shoulder… like micromanaging me, which is what I really like. He just lets me do whatever I want. So he has that trust in me where I can do whatever I want. I can set my own experimental stuff, and he allows me to just work on ideas.

Although Adamari reported her frustration with her research, she could schedule a meeting with her advisor to get some guidance on what to do next. In interview two, she implied,

I had a meeting with my advisor because I was kind of getting frustrated with my project, so I kind of created a presentation of everything I’ve done since I’ve started and I’ve asked for guidance, so that I can know…. see if I should continue with the project, or what new things I should be doing, which worked out great because that was really nice for him to see that I… the progress I’ve made and kind of get some direction.

As time progressed, Adamari continued to meet with her advisor regularly, which allowed her to progress in her program. When asked to provide an update on her advisor in interview four, she stated,

I started two years ago and right now I feel like I’m halfway there. And so I have two more years left. I wrote the timeline for my proposal that I’ll be done in 2018 and my advisor said that seem like a good deadline. So it looks like he’s on board. So I’m happy.

Conversely, when Black and Latino/a/x described their advisors as “not accessible,” participants felt their advisor showed a lack of interest. Participants who did not meet with their
advisor regularly felt their advisor was too busy, which impacted their lab performance. Black and Latino/a/o participants who did not spend time with their advisors suffered from a lack of guidance, which ultimately led to a lack of support. Unfortunately, those who expressed that their advisor provided limited support and lacked guidance also reported being less productive, which impacted their completion date. Using CRT, counter-storytelling allowed James, a Hispanic male, to express his experience of not having access to his advisor and how it impacted his progress during graduate school. He felt his advisor was too busy and travel so much that he suffered academically as a result. In interview one, James said,

He is very busy. He works very closely with the school administration. I would think he’s here half of the time. The other half he’s in central campus. I guess that’s what makes it more difficult is that I don’t interact with him very often, and even when I do, he’s not particularly worried about me having a clear direction. I think that’s part of that he works [inaudible] as an advisor.

In interview two, James reported he could talk to his advisor about research topics. He had scheduled lab meetings and personal meetings; however, his advisor was not present because he traveled a lot. As a result, James did not make major progress with his research project. Because his PI traveled a lot, he does not respond to him in a timely manner, impacting his progress. In interview two James said,

I just try to wrangle them. They’re – faculty members and my PI, he was gone for a good chunk of September. Another one I think he was gone for two weeks in October, and he also – he’s MD PhD, so he does clinic, so trying to get hours for him is kind of tricky.

As time progressed, James’s advisor continued to travel, and as a result, he had less time with his advisor. In interview two, James stated he was supposed to have his prelims the
following spring semester. In interview three, when asked for an update on his prelims, he implied,

I was supposed to. So, we – that was one point, probably the largest point of frustration. There were a lot of delays, in terms of being – so, I originally submitted my proposal in October, and a revised version in January, and an updated revised version, three, I suppose, in February, and unfortunately, my PI didn’t get a chance to read it until about a week before my prelim. And so, and then he had some concerns about some of the things I wanted to do, so now, before the end of the summer, he wanted to get to it, but it was a huge point of frustration, because it was done in October.

Seth reported his advisor continued to travel, and his progress in his program was impacted because of it. Although James’ advisor agreed with him on a completion date, James was not able to complete three articles. In interview six, he said,

Yeah, I mean I think we agreed on the same date. I don’t think he’s, I think he’s too busy to think about, especially the third paper, the PDC paper, to consider how long it’s really going to take if we continue down this path. He was gone for the entirety of October, and so we lost a lot of meeting time.

If Black and Latino/x students have an advisor who is accessible, they are able to receive feedback, ask questions, and progress through their program. Having an accessible advisor was critical, specifically because many participants in this study were first-generation college students and lacked the social capital, which is common historically. These findings suggest Black and Latino/a/x students benefit from having an advisor who is present and willing to provide support and guidance.
**Theme 2: Trust**

Trust was essential to many Black and Latino/a/x participants in this study and had a major impact on the advisor-advisee relationship. Participants said their advisors trusted them more over time. Participants reported their advisors’ demonstrated a different level of trust over time, which illustrated growth. Initially, their advisor’s relationship brought a sense of intimidation; however, as the students progressed in their program and demonstrated skill mastery, trust developed. Students expressed the importance of having their advisors’ trust, positively affecting them and increasing their self-esteem. CRT acknowledges that due to the history of this country, oppressed people tend to seek the validation of those in power. For instance, Caroline, a Hispanic female, stated in interview two,

But I had a meeting with my advisor somewhat recently that just didn’t go that well. And he was just kind of, I don’t know if he was like, distinctly, particularly angry at me, or was also just having an off day. I think it was more about my ability too; I was making a poster at the time for a symposium. And I think it was more about my ability to make the poster robust. And talk, speak critically about my research, and kind of a variety of other things made it seem like I was just really was not doing well. And I was completely messing everything up, which is at least what I took from it, even if that was not his intention.

However, in interview three, she said,

I would say there was kind of a flip flop with my advisor where, around the point at which we last met [for an interview], I felt like he was really disappointed in me and thinking that I wasn’t as proactive as I should be in terms of looking at data and analyzing it and coming up with ideas, whereas I feel like now we’ve reached a better, more harmonious point in which I’m able to, I guess, be less intimidated by him and be able to communicate ideas with him better. I think he has a little bit more faith in me.
Black and Latino/a/x students felt their advisors demonstrated trust in them when they were engaged in their research. When students felt that their advisor was not engaged, they felt their advisor did not trust them to develop strong research questions, follow protocols accurately, and etc which resulted in the advisor not investing in their development or growth as a scientist. Through CRT, Whiteness as property, we argue that advisors who are not interested in the scientific development of their Black and Latino/a/x advisees are not positioning them for success. For instance, Ethan described his advisor as hands-off and not engaged in his research. In interview three, Ethan stated, “Well, this relationship, I feel like if I had a more engaged advisor, I could do better, basically that.” As time progressed, Ethan said his project had the potential to make collaborating partners money. When his advisor found this out, he became more involved in Ethan’s project. In interview four, Ethan implied,

I have felt like he’s a little bit more involved. Yeah, a little bit more engaged in – at least we’ve had discussions much more in depth than we did at the beginning. I feel like – and, I mean, that’s been maybe one or two.

When Ethan’s advisor was more involved with his research, his confidence increased, he felt as if his advisor cared about his research, and he felt like his advisor trusted him. Trust for the Black and Latino/a/x participants in this study was associated with their ability to produce robust research or produce a product that would lead to financial gain. Participants reported when their advisor trusted them, they felt more comfortable in lab. Students gained a sense of confidence when their advisor trusted them; specifically, in the lab.
Theme 3: Communication

Communication was critical for many participants. Many participants reported they communicated more with their advisors as they progressed in their program. Some students felt that their advisors did not communicate as much in the first year because it was common for students to change labs within their first year. Other students reported that they communicated with their advisors regularly from the start of joining their labs. Although participants’ preferences of communication varied, all participants expressed the importance of communication during the study. Students who preferred their advisor communication style reported they felt comfortable in the lab, excelled academically, and as a result was able to progress in their program. It is an important note, and some students felt they learned how to communicate with their advisor more effectively as time progressed.

For instance, Ishmael, a Hispanic male, initially felt he did not communicate with his advisor about research topics. Ishmael reported his advisor has not helped him formulate a research question. In interview one, he stated, “I feel that I am a little bit behind. We are already in November, and I am only in the first phase.” In interview two, He implied.

But since this second year, the relationship with my advisor has gotten better. I can talk more about topics, he gives me more suggestions about things. He is orienting me more, he is giving me more direction on the path where I should move on research-wise.

As time progressed, Ishmael’s communication with his advisor improved. Interview five he said, “I can say that in a positive way. In the sense that he is paying more attention to my progress”. When he updated us about his communication with advisor, he implied. “In this case, yes. My advisor and I are communicating better.”
Laura, a Puerto Rican female, initially felt her advisor did not communicate well and as result, was not helpful. In interview two, she said, “When I need help, in reality I do not go directly to the PI. I go to the postdoc.” The PI is like the secondary person. In the same interview she shared, “My advisor, he’s a good person. Great person. Sweet person. However, he is not going to resolve anything for you. He’s not going to solve your problems.” In interview four, Laura said, “Well, actually, I have seen him more communicative. He is giving me more attention.”

Participants who preferred their advisors’ communication style developed a stronger relationship with their advisors. Participants indicated that they learned how to communicate with their advisors over time, which strengthened the relationship. Participants who felt comfortable communicating with their advisors stated they received more guidance and felt more comfortable talking about challenges they encountered professionally and personally. Adrianna, a Hispanic female, started communicating with her advisor regularly when she joined the lab. In interview one, when asked how was her relationship with her advisor she said, “yeah we talk about stuff (science related). Yes, but I think that’s as far as we go. We don’t get too personal about things. Briefly when I first got here, but there’s a boundary there, which is fine, yeah.” As time progressed, Andrianna still stated that there are still boundaries, but she did mention speaking to her advisor about a personal issue, mental help. In interview four, she implied,

I think we’ve gotten closer. It’s still a boundary because he’s my boss or whatever but I’ve definitely been able to talk to him more. Like more than any other advisor I’ve ever had. Just talk to him about my actual life and telling him how, yeah, I’ve been really sad and I’ve been going to therapy. And I’m on medication. And oh my god, these are like magic pills. And he was like, ….Yeah, and it probably doesn’t hurt to have mountains and just pretty stuff to see and exercise [while she is doing field work in another state]. And I’m like, Yeah, you’re right.
No Change

No change was not commonly used. However, when it was used, participants stated there was no change in their relationship with their advisor on three occasions: the participants preferred their advisor-advising style from the beginning and described it as a “good match” the entire study; the participants did not prefer their advisor-advising style from the beginning and described it as a “mismatch” the entire study, or the participant stated there was no change within the relationship from the previous interview. When asked if participants noted any changes with their relationship with their advisor, Paul replied, “I think it’s more, things have been the same,” Nathan replied, “No,” and Angela replied, “No. I think it’s pretty much been the same.”

Findings Summary

This form of counter-storytelling illustrates how CRT allows minority graduate students to be the author and share their own stories as opposed to those in power narrating their stories. For minority participants, three reoccurring themes influenced how the advisor-advisee relationship evolved over time; accessibility, trust, and communication. Participants who expressed their advisors’ were accessible reported they were helpful, supportive, provided guidance, and answered research questions. Students whose advisors were not accessible could not receive feedback in a timely matter, had limited support from advisors and struggled to progress through their program. Participants reported their advisor’s trust for them grew over time. Commonly, scholars express how important it is for students to trust their advisors, but we add the importance of advisors trusting students. Trust was centered around the students’ research ability. Communication between the advisor and advisee is critical to the evolution of
the relationship over-time. Participants who preferred their advisor’s communication style reported they felt more comfortable discussing personal and professional information over time.

**Discussion**

Although the Black and Latino/a/x participants in this study were enrolled in various STEM programs, their collective experiences regarding advising echoed its significance in their experiences as graduate students. Our findings from this study confirm our expectations based on the previous literature that the advisor-advisee relationship is a critical component for minority students in a graduate program (Garden, 2008; Goldman & Goodboy, 2017; McCoy et al., 2015; Patton, 2009; Reddick & Young, 2012). Like Griffin et al. (2018), our findings indicate that having a receptive advisor is beneficial for personal and professional growth, and accessibility can make or break the advisor-advisee relationship. Faculty openness was a key component to building strong relationships. Participants preferred advisors who were accessible and saw open-door policies, one-on-one meetings, and lab meetings as opportunities to gain feedback and guidance. Our overarching contribution to the body of work on the advisor-advisee relationship for graduate students is that features like accessibility, time spent with the advisor, and satisfaction with the advisor’s advising style change over time. Whereas accessibility to the advisor might be critical for the student’s early adjustment to graduate school, over time, the student might develop alternative professional networks (in or out of the lab) to bolster their support networks, fill the void left by a non-responsive advisor, to collaborate with, or to find answers to their research questions.

This study’s findings indicate that minority STEM students may need a different level of advising due to limited access and opportunities to terminal degree programs. Black and Latino/a/x students also mentioned that the quality of time spent with the advisor was essential to
the relationship. For Black and Latino/a/x students, as with other students, time spent with advisors allow participants to learn to communicate effectively with their advisor (Goldman & Goodboy, 2017), to become comfortable discussing personal concerns (Inman et al., 2011), and with time to adjust to and develop a working relationship with their advisor (Schlosser et al., 2003). Whereas previous literature reported the amount of time students spent with their advisors was positively related to advisee satisfaction (Inman et al., 2011), our findings confirm a similar result while also showing that advisee satisfaction also changes over time. As you can recall, both Robin and Caroline stated that as they spent time with their advisor, their relationship got stronger. As students spent time with their advisors, they were able to gain a better understanding of their advisors’ advising style and strengthen their relationships.

Several participants who were not initially satisfied with their advisors’ advising style changed their perspectives as time progressed. We found that the Black and Latino/a/x perspective of trust changed over time and strongly influenced the advisor-advisee relationship’s development. This supports prior work by Golde (2005), who found that incompatible advising relationships were marked by a lack of trust and were the cause of much of the attrition in science departments. In this study, participants were happy when they believed that advisors displayed trust for their advisees. The majority of the participants spoke about feeling unsure or intimidated by their advisor at the beginning of the graduate program, but as they progressed in their program, they discussed how their advisors showed they trusted the participants and their abilities. Therefore, when the advisor demonstrated trust, participants were happy and felt good, and as a result, their self-efficacy beliefs and confidence as a scientist increased. These findings add to the literature showing that trust is a crucial component to the development of the relationship between students and faculty (Erdem & Aytemur, 2008). Moreover, the findings
show that for Black and Latino/a/x students in STEM, trust is earned over time and not necessarily based on the advisor’s implicit responsibilities to help his/her students successfully navigate through to successful completion of the doctoral degree.

Based on the student’s comments, the findings highlight the importance of communication as it pertains to the advisor-advisee relationship over time. Participants who preferred their advisors’ communication styles reported that they received more guidance and support from their advisors. According to Goldman and Goodboy (2017), communication is important to maintaining a positive relationship between students and advisors. Participants who communicated with their advisors said that they made progress in their program. Carpenter, Makhadmeh, and Thornton (2015) reported mentors provide their students with knowledge, advice, stimulation, and support. On the other hand, in this study, participants who did not prefer their advisor’s communication style did not feel comfortable talking to their advisor. The results confirm Inman et al.’s (2011) suggestion that students tend not to disclose information with their advisor if they are not satisfied with their relationship. Ultimately, participants indicated a lack of interest made them feel as if their advisor was not interested.

Conclusions

The majority of participants in this study reported that their relationship with their advisors changed over time. Accessibility, trust, and communication were recurring themes that influenced the advisor-advisee relationship. First, our findings support previous findings that advisor-advisee relationships are impacted by students’ perceptions of their advisors’ consistency, ability to communicate, and interest in teaching the advisee (Erdem & Aytemur, 2008). Second, this study suggests that advisors who are accessible positively impact their students over time because they provide research guidance and help them progress towards
degree completion. When students have access to their advisors, they tend to regularly meet with their advisors, leading to students receiving the support and guidance needed to navigate through their graduate program. Third, it is beneficial for students to spend time with their advisors from the student’s perspective because this helps develop a relationship where advisees will feel comfortable asking professional and personal questions. For Black and Latino/a/x students, time allows them to get used to advisors’ advising styles and bridge cultural differences, which helps them build a healthy relationship. Fourth, students’ self-confidence is positively impacted when advisors show or tell advisees they trust and have faith in them. Initially, graduate students feel their advisors are unsure about their ability to produce research, potentially fueled by their self-doubts. When advisors give them independence and demonstrate confidence in their students, graduate students feel more confident in their capacity as scientists. Lastly, based on our findings, communication is a critical component of the advisor-advisee relationship. Students who prefer their advisors’ communications style tend to navigate more smoothly than a student who struggles.

In conclusion, our results suggest that Black and Latino/a/x students can build stronger and productive relationships with their advisors when they meet with their advisors regularly, spend time with their advisors (in the lab, weekly meetings, etc.), and learn to communicate with their advisors. The study also provides insights into what Black and Latino/a/x students say advisors can do to build a stronger relationships. The students say that they welcome it when advisors display trust by explicitly or implicitly telling students that they trust them. Our findings show that it is possible for students to start off not preferring their advisor’s advising style in the beginning, and as time progress, they can adjust to it. Moreover, students internalized the feelings they had about the relationship and connected these feelings to their
level of productivity. Black and Latino/a/x students who were satisfied with their relationship, either from the start or through an improved relationship, reported feeling supported and motivated. Conversely, Black and Latino/a/x students who were unhappy or frustrated with the relationship and did not see improvements over time reported their advisor was not interested in their project and felt unproductive.

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CHAPTER IV

HOW THE ADVISORS ADVISING STYLE INFLUENCE THE CAREER DECISIONS OF BLACK AND LATINO/A/X STUDENTS IN STEM GRADUATE PROGRAMS

Abstract

The advisor-advisee relationship can influence students’ career choices, yet little is understood as it pertains to Black and Latino/a/x in STEM (German, Sweeny, & Robbins 2019). The purpose of this study is to investigate how the advisors’ actions influence the career decisions of Black and Latino/a/x students’ in STEM graduate programs. Critical Race Theory (CRT) was used to explore Black and Latino/a/x experiences at Predominately White Institutions as it provides an in-depth understanding of the issues in postsecondary settings (Patton, 2006). Using a qualitative research approach, data were collected through six individual semi-structured interviews over three years with each participant. The interviews were audio-recorded, transcribed, and analyzed with emergent coding. This study’s data emerged from a larger study focusing on the experiences of underrepresented minority students enrolled in STEM/SBE graduate programs at three Predominantly White Institutions in the Midwest. Purposeful sampling was used from this larger population to identify 19 Black and Latino/a/x in STEM graduate programs for a more in-depth analysis of how the advisors’ actions may influence STEM minority students’ career decisions. This study’s findings illustrate that Black and Latino/a/x students in this study benefited from advisors asking about career interests, discussing career options, being a role model, and assisting with networking and resources, with networking, and discussed career options with students.
Introduction

Science, technology, engineering, and mathematics (STEM) fields have suffered from a shortage of trained professionals, causing the United States to struggle to compete globally (National Science Foundation, 2006). Part of the struggle is related to a lack of participation and degree attainment by historically underrepresented groups, particularly at the post-baccalaureate level (National Academy of Sciences, 2016). Studies have frequently found that women, underrepresented minorities (URMs), first-generation students, and those from low-income backgrounds leave STEM fields at higher rates than their counterparts (Griffith, 2010; Hill et al., 2010). It is critical that higher education institutions help STEM graduate students persist to degree completion, which will ultimately produce more advanced degree holders in STEM disciplines, especially among URM individuals (Bair & Haworth, 2004). To increase minority participation in STEM education, recruiting more students from underrepresented groups is critical, yet scholars have stressed that recruitment is more successful when minorities assist with it (Covington et al., 2017; Foltz et al., 2014). This is a circular challenge, however, as the low numbers of minorities in the field makes it difficult to recruit others.

Higher education institutions struggle to recruit and retain minority students in STEM graduate programs (Carver et al., 2017), particularly at Predominantly White Institutions (PWIs) (Jones et al., 2002). One of the consequences of this struggle has been a continued shortage in the number of minority graduate students who pursue a faculty career in STEM departments (Blackwell et al., 2009). NSF reports indicate that URM STEM associate and full professors occupy 8% of senior faculty positions at all 4-year colleges and universities and about 6% of these positions at the nation’s most research-intensive institutions (NSF, 2013). URM women hold even smaller shares of these academic STEM positions, and an increase in their
representation is essential considering female URM undergraduate students enrolled in STEM majors outnumber their male peers. This racial and gender disparity in faculty STEM positions is a significant retention and recruitment issue because minority students tend to search for mentors and professors of color and view them as role models (Griffin et al., 2010).

Although several plausible factors may affect attrition in STEM graduate programs; previous scholars have highlighted the importance of graduate students building productive relationships with advisors. Prior studies found that minority students benefit from advisor-advisee relationships that are based on care and concern for the individual and that encourages advisees to persist through academic challenges (Davidson & Foster-Johnson, 2001; Ostroff & Kozlowski, 1993; Patton, 2009). Young and Brooks (2008) suggest that graduate students of color are more likely to succeed if their faculty advisors adopt responsibilities above and beyond academic roles. While these studies contribute to our understanding about what URM graduate student advisees need to complete the doctoral degree, less is known about how advisors influence minority STEM graduate students’ career choices (German et al., 2019). Is there a shortage in URM faculty due to a lack of encouragement from advisors regarding the pursuit of faculty careers? While we know advisor-advisee relationships are vital for underrepresented students in STEM (Adams, 1992; Gildehaus, et al., 2019; Welde & Laursen, 2008), we know less about the impact of the advisor-advisee relationship on students’ career decisions. Understanding how the advisor-advisee relationship influences career decisions will allow faculty advisors to better assist their advisees because they will understand how their interaction might influence students’ career decisions. Therefore, the current study will examine how the actions of advisors influence Black and Latino/a/x graduate students in STEM programs career decisions. Using Critical Race theory, this research provides an examination of how vital the
advisor-advisee relationship is to graduate students’ success and how advisors can influence career aspirations.

Literature Review

The advisor-advisee relationship is a critical component to graduate student success (Austin, 2002; Patton, 2009). Bloom et al., (2007) found that graduate students prefer advisors who are accessible, caring, provide individual guidance for each student, serve as a role model, and proactively integrate students into the profession. In addition, students reported not preferring advisors who are inaccessible, unhelpful, and uninterested in their development as a graduate (Barnes et al., 2010). Carpenter et al. (2015) reported students said they benefited from advisors engaging with their mentees by attending student presentations, navigating through hostile environments, introducing students to research team environments, and collaborating with their research as critical ways to help them develop as scientists. While these studies provide evidence that students were able to articulate their preferences in the type of advisor they wanted, they focused on the preferences of non-minority students whose needs might be different and who could easily find faculty advisors who share a similar racial background.

Although advisors are beneficial to all graduate students (Barnes & Austin 2009; Johnson, 2007; Noy & Ray, 2012), several scholars highlight how vital advisor-advisee relationships are for minority students (Griffin et al., 2020; Griffin et al., 2011; Patton, 2009). Previous literature suggest, advisees benefit from advisors who are accessible (Bloom et al., 2007), supportive (Schlosser et al., 2003), and encouraging (Richmond et al., 2019). Unfortunately, students tend to report negative experiences with their advisors when they are distant, unhelpful (Barnes et al, 2010), and lack supportive skills (Cole and Espinoza).
Although evidence suggests the advisor-advisee relationship is a must, students of color struggle to identify faculty to work with (Griffin et al., 2010; Patton, 2009). Since students struggle with identifying a faculty member to work with, building a relationship with them is even more of a challenge. It is common for minority students to search for professors of color, yet in many STEM departments, there are few or no faculty of color (Griffin et al., 2010; Griffin et al., 2011). Blake-Beard et al. (2011) reported that students who were paired with a mentor of their race and gender reported receiving more help than students who were paired with a mentor from a different race and gender. Unfortunately, due to the lack of diverse faculty to choose from, students of color are often mentored by faculty outside of their race (Griffin, 2010; Patton, 2009) and as result, sometimes receive poor mentoring which impacts their overall graduate experience (Brunsma et al., 2017).

McCoy et al. (2015) found that White faculty members treated all of their students the same regardless of race and gender. Due to the lack of experience working with minority students, White faculty felt treating all students the same was fair and would limit bias or racism. This assumption puts students of color at a disadvantage because their graduate experience is not the same as all other graduate students. Students of color not being adequately mentored can lead to psychological challenges, including low self-efficacy beliefs and stereotype threat (Perna et al., 2009). Due to the low number of minority faculty in higher education, all faculty need to be appropriately trained to mentor minority students because the chances of graduate students being paired with a faculty member of color are slim. Having trained advisors to advise minority students is important because prior studies have shown that the advisor-advisee relationship is critical for the personal and professional growth and development of graduate students (Willis & Davis, 2007).
Advisor mentoring has been found to positively impact career commitment (Paglis et al., 2006). Advisors can provide valuable knowledge to graduate students to facilitate their growth as researchers and scholars (Noy & Ray, 2012). Prior research has suggested advisors may assist graduate students with self-esteem, competence, and career efficacy (Paglis et al., 2006). Bloom et al., suggested it is beneficial for students’ career aspirations when advisors introduce them to experts in their field encourage them to attend conferences and discuss career options. Advisors serve as role models and are central to helping students with networking (Patton, 2009). Students whose advisors provide career guidance have a higher chance of pursuing careers in STEM (Prime et al., 2015; Welde & Laursen, 2008). Specifically, STEM students who are mentored by faculty in the academy are encouraged to apply to academic positions (Sauermann & Roach, 2012). These mentoring activities are essential to graduate students pursuing STEM careers.

Although several studies have indicated the importance of advisors providing career guidance, it is not always done. Austin (2002) reported that students received few opportunities to interact regularly with faculty to discuss and explore career options. When students do not have the chance to discuss career options with their advisors, they tend to miss out on opportunities due to lack of awareness. Similarly, Davis and Fiske (2000) found that 37% of their respondents reported receiving little academic career guidance. In many cases, when students reported not receiving career guidance, it was linked to having unsatisfactory relationships with their advisors (Schlosser et al., 2003; Welde & Laursen, 2008). When students did not prefer their advisor’s advising style, it negatively impacted their career path (Lechuga, 2011; Russell et al., 2018) because negative experiences often led to diminished career prospects (Maher et al., 2020).
Framework

Critical Race Theory (CRT) (Hiraldo, 2010) epistemology focuses on the shared historical conditions and collective experiences and standpoints of and for people who have been systematically oppressed (DeCuir & Dixson, 2004). Ladson-Billings and Tate (1995) posited that CRT analyzes the role of race and racism in perpetuating social disparities between dominant and marginalized racial groups. CRT collectively acknowledges the underrepresented group’s experiences without classifying them as a homogenous group, recognizing the multitude of varying characteristics held by individuals such as race, gender, sexuality, religion, and more (Patton, 2016). Additionally, CRT gives a voice to marginalized racial groups who share similar experiences to better understand their viewpoint (DeCuir & Dixson, 2004). CRT provides a lens through which researchers question, critique, and challenge the manner and methods in which race, white supremacy, supposed meritocracy, and racist ideologies have shaped and undermined policy (Harper et al., 2009). This approach acknowledges racism as a normal part of everyday life in America for all Americans (Yosso, 2001).

Underrepresented minorities in doctoral programs tend to have a unique set of experiences. In alignment with the study’s purpose to gain a perspective on advising from the standpoint of minority students in doctoral programs, CRT places participants at the center of this analysis by prioritizing their lived experiences. To further disrupt academic prose in higher education, CRT has several tenets central to the design of this study: (a) the concept that a shared group experience exists among marginalized people and that the expressions of such experiences are unique and different according to everyone, (b) counter-stories and the voices of students of color were used to analyze higher education’s climate, (c) CRT rejects the notion of a
“colorblind” society, and (d) CRT can and should be used as an epistemological lens for studying and transforming higher education as part of a larger social justice agenda.

Methodology

This paper’s data derive from a more extensive mixed-methods study focused on identity integration for URM STEM and Social, Behavior, and Economic Sciences (SBE) graduate students as they joined a disciplinary community of practice (NSF AGEP:BPR Grant #1309055). Through a longitudinal approach, data was collected and analyzed to develop an in-depth understanding of factors critical for URM students’ retention in graduate programs and their transition into their professional communities. The participants in this study were 34 URM STEM or (SBE) graduate students who participated in semi-structured interviews, Likert-scale surveys, and social networking surveys to allow us to better understand underrepresented minority graduate students’ experiences at PWIs.
Research Design

For the study described here, a qualitative research design (Creswell, 2009) was utilized to allow for a more in-depth examination and understanding of how the advisor-advisee relationship may impact minority graduate students’ career decisions. Specifically, a phenomenological approach was used to understand how different advising experiences and the experiences minority students have in graduate school influence their career decision. A multisite case study approach was utilized to capture a diverse range of experiences (Merriam, 2015). Integrating Critical Race Theory framework suggests the study’s design and the data analyses will be conducted using an intersectional lens, including race and gender.

Phenomenology aligns with CRT in rejecting the notion that one can and must decontextualize one’s race, gender, and class as a detached observer to produce credible, scientific evidence. CRT was used to gain a better understanding of the impact of the advisor-advisee relationship on career choices using a critical lens. The study was designed with the understanding that minority students have a unique set of experiences while enrolled at PWIs, and that these experiences from a non-dominant group can inform our understandings of graduate education and the advisor-advisee relationship in ways that would not otherwise be exposed. The use of participants’ lived-experiences and derived meanings contributed to capturing the importance of the advisor-advisee relationship for career decisions among minority students in graduate programs.

Sampling Procedures

The research site took place at three PWIs located in the Midwest region of the United States. Three institutions were included in the more extensive study, but one institution with a
small graduate population did not have any participating STEM students. Therefore, the STEM students within the study are from two PWIs in the Midwest. Purposeful sampling (Patton, 2002) was used to select STEM participants for this study, excluding students enrolled in SBE graduate programs. Fourteen graduate STEM students from the larger sample were selected. Selection criteria for this study included (1) STEM students, (2) first- or second-year graduate students at the time of study enrollment, and (3) identification as underrepresented minorities. The PI accessed students for recruitment through the institutional registrar’s office at three different PWIs in the Midwest. The Human Subject Institution Review Board (HSIRB) approved recruitment email was sent to all students who met the selection criteria. Students received a pre-survey, which included demographic information, identity scales, and social support scales after consenting to participate. After completing the survey, participants were given the option to provide their contact information in an unlinked online form to indicate interest in the study’s interview portion. All students who expressed interest in participating in the study were contacted, and interviews were scheduled.

Data Collection

Six semi-structured interviews were used to gather data that captured how the advisor-advisee relationship influenced minority students’ career decisions. Interviews were conducted approximately every six months over a 3-year period. Most interviews were conducted in person at various locations on or near the university campuses by one of five interviewers who followed semi-structured interview protocols. Locations near campus enhances the needed aspect for participants to answer questions in their natural environment (Creswell, 2009). Interviews were
conducted by video conference if participants were unable to meet in person. Interviews lasted 30 to 154 minutes.

There were unique protocols used for each of the six semi-structured interviews, although each protocol included questions about participants’ relationship with their advisor. As participants progressed in their programs, the protocols included questions targeted towards their career plans. These included prompts asking about their advisors and how they assisted with career aspirations, who was helping them build their professional network and advance in their field, how have their career plans changed since entering your program, and how do people in their support networks feel about their career plans. Discussing career decisions and advisor relationships allowed researchers to gain an in-depth understanding of how advisors may influence career decisions.

**Data Analysis**

Using phenomenological methods, data was analyzed using interviews, which were audio-recorded and transcribed by professional transcribers. Dedoose, a software program for managing and coding qualitative data, was used to organize and label the coded data. Once interviews were thoroughly read, participants’ responses were analyzed, and emergent codes were developed by the research team. Each researcher was adequately trained to read each transcript and identify the correct codes, including participating in a rigorous and lengthy intercoder agreement and codebook refinement process. Intercoder reliability was assessed before coding all transcripts. Fleiss’ Kappa coefficient (Schaer, 2012) was used to calculate the research team intercoder reliability. Since we coded with five trained researchers, ReCal3, an online tool was used to calculate reliability for three or more coders (Freelon, 2010). Our
research team scores ranged from 0.61 to 0.80, which indicated “substantial agreement” using the kappa statistics agreement measures for categorical data scale (Landis & Koch, 1977, p. 165).

The five-member research team generated a codebook with code names, definitions, and example codes. Each transcript was coded and discussed by three researchers to increase accuracy, limit bias, and ensure an intercoder agreement was met. The following codes were used from the codebook Good Match, Mismatch, and Neutral. Then the first author developed two additional codes Advisor Influence on Career Decision, and Career Pathway/Career Plan to capture how the advisor influenced participants’ career decisions. The codes were already coded in one of the three codes generated by the research team (Good Match, Mismatch, and Neutral). The first author recoded based on how the advisor interacted with their advisor as it pertained to career support. The following codes in Table 1 were used to identify relevant interview sections to understand better how the advisor-advisee relationship influences STEM graduate students’ career decisions. Pseudonyms were assigned to each participant, and identifying characteristics were removed from the transcripts.

*Credibility and Validity*

In keeping with Rolfe’s (2006) strategies for rigor and trustworthiness for phenomenological methodology, reflexivity was used throughout the study by having weekly discussions with our research group and internally reflecting while coding. This was important because the first author is a minority female graduate student in a STEM field and brought her own perspectives about the advisor-advisee relationship and experiences with a white advisor to the data. Being reflective and regularly discussing findings with her advisor allowed her to separate her experiences and opinions from those of the participants.
Overall rigor was obtained through multiple avenues. The codebook was created and tested repeatedly by a five-member research team to develop shared understandings of the codebook and to ensure each researcher’s consistent use of the codes (Ryan & Bernard, 2000). The researchers engaged in member checks and peer debriefing to enhance this analysis’s trustworthiness (Carspecken, 1996; Marshall & Rossman, 2011; Merriam, 2009). It is important to note that we coded the transcripts individually before discussing our thoughts with other members of the research to limit possible influence (Carspecken, 1996), yet engaged in open and honest discussion and debate of the data and its analysis to ensure multiple viewpoints were included in our meaning-making. These steps were critical for establishing the credibility and validity of the study.

**Limitation of the Study**

There are several limitations to this study. First, only nineteen Black and Latino/a/x participants were interviewed. Typically, a small number of Black and Latino/a/x students in graduate STEM programs make it difficult to recruit from that population. They are also over-sampled regularly due to the low numbers of Black and Latino/a/x students, which may lower interest in participating in another study. To alleviate this concern, we offered incentives to complete each data collection activity in our study. Second, some students began the study in their second year, so the initial interaction with their advisor was not discussed as much. On the other hand, students who started in their first year did not reach the end of their program by the sixth interview and may not have discussed careers at length with their advisors. Although a longitudinal approach was taken to capture as wide a window as possible, the study did not capture the full graduate experience for the fourteen graduate students included in the sample.
Third, the study was conducted at two PWIs in the Midwest, though participating students represented a variety of geographical backgrounds. Nationwide research could increase our access to minority students in STEM graduate programs and better capture varying attitudes towards racial diversity across the U.S.
### Table 2

**Codes, Definitions and Examples**

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
</tr>
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<tbody>
<tr>
<td>Good Match</td>
<td>Describing she likes the advising style of the advisor and why.</td>
<td>My advisor is extremely helpful when it comes to writing proposals. We just found some back-and-forth because I have, I don’t know, eight versions of it stored on my computer. Which the first version is awful then to the last. (CAROLINE) I think that my advisor in particular could do more to kind of ensure that her students are – because I’m in a situation where I’m in a research group, but I think my advisor could be more helpful in helping me determine a specific project.... That’s been my toughest challenge so far, is deciding whether this is the type of mentorship I need. (RUTH)</td>
</tr>
<tr>
<td>Mismatch</td>
<td>Describing she does not like the advising style of the advisor and why.</td>
<td>“I mean it hasn’t changed much, my relationship with my advisor, how I see her” (CODY).</td>
</tr>
<tr>
<td>Neutral</td>
<td>Describing she has no change, or the statement is not like/dislike as it pertains to the advisor relationship.</td>
<td>“I think mainly just like the interactions I, well, my first two advisors were women, and the way they acted and carried on, I don’t think they’re. they’re probably not the best representation of women in sciences, but they are my experience and, at one point” (COURTNEY).</td>
</tr>
<tr>
<td>Neutral</td>
<td>When a participant talks about how their advisors impact career decisions.</td>
<td></td>
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*Continued*
Table 1

Continued

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
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<tbody>
<tr>
<td>Advisor Influence on Career Decision</td>
<td>When participants discuss the path they have taken to get to their intended career, what it takes to become a professional in their intended career, or what they intend for their future career</td>
<td>So, like I said, research scientist, which is like, it’s kind of academia, but not really” (MANUEL).</td>
</tr>
<tr>
<td>Career Pathway/Career Plan</td>
<td>When participants discuss the path they have taken to get to their intended career, what it takes to become a professional in their intended career, or what they intend for their future career</td>
<td>So, like I said, research scientist, which is like, it’s kind of academia, but not really” (MANUEL).</td>
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Findings

The findings from this study illustrate how the advisor-advisee relationship influences graduate students’ career decisions. This section is organized around four inter-related themes: asking about career interests, discussing career options, being a role model, and assisting with networking and resources. It is important to note students spoke about various networking and resources; however, this paper is focused solely on the networking and resources provided by the advisor. The four inter-related themes are presented below with interview excerpts to illustrate the themes and provide a voice for Black and Latino/a/x participants.
Theme 1: Ask About Career Interests

The data suggested advisors and advisees benefited from conversations centered around careers. Advisors must ask students about career aspirations because it allows advisors to provide better advising. Students preferred advisors to ask them questions about their career aspirations rather than initiating the conversation. When advisors asked about their advisee’s career interests, participants interpreted their advisors’ inquiries to mean that the advisor was supportive and cared about them. Unfortunately, some advisors did not have career conversations with their advisees. When advisors assumed their advisees preferred one career over another rather than asking, they did not provide proper advising. Participants Paul and Seth mentioned their advisors did not ask about the career goal; they just assumed. When they asked if their advisors spoke to them about career options, Seth said, “I never said I wanted to work in the industry until very recently, when my boss always assumed that I was doing that. I never told him that. He just assumed I was going into industry.” Similar, Cesar replied,

Because I mentioned industry to her and she said she’s surprised. She said she thought that the way I think and approach problems is very much the way an academia does, and why…because of that she thinks academia is a better fit for me.

Theme 2: Discuss Career Options

Participants benefited from advisors discussing career options with them. Many participants were first-generation college students and leaned on their advisors to expose them to unknown career possibilities. Advisors who discussed career opportunities with their advisees exposed them to different options they were not aware of. For instance, Caroline had an interest in academia but did not want to work at an R1 institution. Below is Caroline’s response to her
advisor’s career guidance, which included resources about postdoc positions and different types of universities she had little to no prior knowledge. Caroline said,

He’s also really great to talk to about the future, like about different postdoc opportunities, what kind of different fellowships are available; teaching versus research-oriented postdocs, all these kinds of things about when is it time to start thinking about this, and who are the people to start thinking about for postdoc advisors, and what are the benefits to working at an R1 versus R2 versus R3 institution, and all those types of things.

Similarly, Ethan mentioned he spoke to his advisor about a career as a professor. He said,

Yeah, I mean that – we did talk about things like that, and I do see – I mean, like, if I could have his job, it would be something great. Now that he’s well established, he travels, he’s involved with administration, and he was telling – yesterday at the group meeting, he was telling us about his trip to Saudi Arabia last week, which was on a whim. He was part of a delegation. You know how Trump was there? He was part of that whole delegation that went there.

On the other hand, when advisors did not talk to students about career options, students felt uncertain and did not receive answers to unknown questions. For example, Scott did not speak to his advisor about career options and felt their relationship was research only. Here is how he responded when asked if his advisor talked to him about postdocs and careers.

Absolutely not. Absolutely not. No, no. It’s a strictly research relationship and I think it has to be, except for the occasional query on the family. It’s like, no. Maybe, because I haven’t brought it up, because I want to get my paper done, you know. Work on this, have time for this. So, no, that’s never come up and, that probably needs to come up. I have an idea career wise of what I want to do. I think I want to do like a teaching, like a smaller school, I don’t think I want this type of R1 experience. I’m thinking more like a smaller school, maybe starting up a computational intensive. Because I think a lot of schools don’t really have that resource or have my sense is that it’s on demand, people with good computational skills. So, maybe having teaching experience with this class certificate and everything, and having a couple TAs GSI’s under my belt might make me a good candidate for that.
Theme 3: Being a Role Model

Advisors are role models for their advisees. Unfortunately, advisors can be positive or negative role models. Advisors should be cautious with how they display their faculty role because the advisors’ actions influenced participants in this study. For instance, Seth enjoys writing and is interested in the flexibility he sees his advisor have as faculty. He stated,

Yeah. But, you do your own research on what you find important and write your own grants. I really do still like writing a lot, actually. The idea is kind of cool. You fly all over the world. He’s in Boston right now.

Advisors who express their passion and joy for their careers show students the positive part of academia. When participants saw their advisor enjoying their job, it sparked an interest. Adriana felt her advisor liked his job and highlighted how he had more flexibility as a researcher than a professor. Adriana said,

I have talked to a lot of professors and asked them if they like their job and what they do. Being here, I’ve talked to my mentor, who is a research scientist. He constantly tells me he loves his job and it’s great. He’s like, “Once you get to be more experienced, you just have so many meetings it’s exhausting.” Last time we talked, he was frustrated because he wanted to go to a seminar but he couldn’t because he had a teleconference. I’m like, “Oh, that sucks.” “Yeah, this is the second meeting of my day and I still have another one.” I’m like, “Well, have they at least been productive?” “Well, this one has.” It made me feel good. I was one of the positive meetings of the day. But, I can see how he’s not being pulled in all directions as much as being professor, but he’s still very, very busy. Again, this positive energy. He still loves his job and he wouldn’t trade it for anything. He loves having such a flexible schedule. He has a new baby, so he has to go home. Or, if he’s sick he can leave. That sounds pretty great.

Although Scott was interested in being a professor, he mentioned he was second-guessing his decision to become a professor because of the crazy lifestyle. Scott’s perception of his advisor was that he worked a lot and did not have much time for his family. He explained,
Yeah, I really don’t know at this point. The reason I don’t say professor is because it’s just such a huge time, work commitment, and it’s really hard, as you know, I’m sure to take that much time away from your family so... I don’t know. Then there’s also my wife has her career goals so, yeah, it’s hard to really pinpoint at this point what the future is going to hold.

Students interested in pursuing a career in the academy struggled with seeing the positive side of a faculty career when their advisor does not demonstrate positive behavior. Students question if they want to pursue science-related fields when they do not prefer their relationship with their advisor, don’t like what they see from their advisor, or who their advisors are as people. Students wanted to avoid being like their advisors or having to work with people like their advisors. When asked about pursuing a career as a professor, Adamari responded,

I don’t think I ever, I don’t think I have…. I do have career goals, but I don’t think I know exactly what they are. I don’t know if I wanna be a professor, or if I wanna be a scientist. I don’t really know what I wanna do with my degree. Because I’m not sure, maybe if I wanted to be a professor, and I’m dealing with this stuff it would make me realize that I don’t want, I know that I don’t wanna be like him. And that’s what I’ve learned from all this situation. He really pisses me off. He really... And so, I don’t want that. I don’t wanna be like that. I use the way he treats me as an example of what I don’t wanna be.

Similarly, Courtney was undecided between pursuing a career as a medical physicist and professor. When asked which important key things have happened since she started her graduate program that have made her change her idea about a future job, she replied,

This was my third advisor switch. So, three of those. Then also my first two advisors I had were women, and those were not good experiences. I don’t feel like I got...Even some of the other women faculty in my department, I haven’t really had, I’d say, a mentor relationship with. I think, as a woman, I think that’s problematic.

She continued to speak about her first advisor and said,
So my previous one, I think, initially, I really admired her, and now it’s completely different it’s the complete opposite. I think she’s almost everything I wouldn’t want to be if I decided to do a track in academia, but initially I really thought that she was just this powerhouse and just amazing, and “I want to be like her,” but completely opposite.

**Theme 4: Assisting with Networking and Resources**

The data suggested it was beneficial to students when their advisor provided them with networking and resources to assist with career options. When advisors introduced students to experts within their field, it increased the chances of making connections that could benefit them in searching for what’s next. Although Paul’s advisor assumed he was going into education because she felt like that was a better fit for him, once she found out his interest was working in industry, she assisted with networking on his behalf. When asked how his advisor assisted with networking he said,

But a few weeks later, when she did one of her travels, work travels, she went and talked to a research lab, and it happens to be in Connecticut, far away, and she mentioned that they’re looking for PhD students to intern for the summer. And so when she came back to town she told me, individually, that this is a possible thing that I could do next summer. So she’s looking out now for my interests, if I want to get industry experience through doing an internship as a PhD. It’s an option. I’m not sure that I’m going to take it, but it’s a sign that, that she’s now somewhat thinking about, or looking to support, the next step in my career, which is very positive.

Students who participated in research collaborations initiated by their advisors were able to expand their networks. Students felt more comfortable speaking to scientists and using specific terminology. Cody indicated,

Yes. So right now, I’m collaborating with a professor from the University of Delaware and also a professor from the University of New Mexico. These relationships were facilitated through my advisor and my department. These two
people that I’m collaborating with has, well, one of them they do research similar to what I do. Well, I’ve learned, I’m learning how to communicate with research scientists who’ve been doing this for a while. As a grad student, you may not be comfortable using certain words. You don’t want to sound dumb but you have to force yourself to craft an email to sound like you know what you’re talking about. So it’s going.

In contrast, students who did not have an advisor who assisted with networking struggled to make those meaningful connections essential for career exposure. Participants felt advisors who were not assisting with professional networking were not supportive and not beneficial to their career. Adamari said,

No, I went to a conference, and it was the weirdest, like, I’ve been to conferences with other professors. And they have dinner with you, and they talk to you, like, invite and then they have, like, they introduce you to other professors, and he would like look at you at a conference and it was, like, he didn’t even know you. Like, he was out to get his own network, I think, and then it was the weirdest conference.

Additionally, it is important to note that participants utilized their advisors’ networks when considering career options. For instance, Nathan implied,

Yeah, that’s why I want to get the pharmacology side because my advisor has a very, very strong list on the pharmacology side – he knows some of the biggest names in breast cancer and pharm – so I want to try as much as I can to get my name in that sector if he thinks that’s an option, probably not anything fast.

Building professional networks and having access to opportunities such as TAs are beneficial to students when exposing them to careers, specifically in academia. Participants who were able to TA during graduate school had a chance to experience a career in the academy. Ismael was thinking about becoming a professor. When asked if he had decided on a career path, he replied, “I am still thinking on it; however, this TA experience has strengthened my idea of becoming a professor. Unfortunately, all of the students did not have the opportunity to have
a TA experience, but still they saw the benefit of this experience for those interested in a faculty career."

Nathan applied twice for a Graduate Student Instructor position and was rejected both times. Because a limited number of available teaching opportunities existed in Carlos’s area of specialization, his advisor offered him a chance to train an undergraduate student. He replied, “The one time I actually want experience, I, of course, didn’t get it and, hopefully, now mentoring this student might help at least that component.”

As previously mentioned, Caroline’s advisor discussed career options with her. The advisor spoke to her about various types of research and teaching institutions. Her advisor encouraged her to participate in the Preparing Future Faculty program. The program helped Caroline better understand different types of institutions through campus visits, particularly in learning about R-2 institutions. Caroline said,

I’m not sure because I recently talked to my advisor – he was talking about how an R-2 might be a good fit for me – and I was already thinking, “That seems like too much research,” and getting worried about it because I didn’t know what an R-2 institution looked like or what that workload was like. So, I don’t think it really was until we did this campus visit that I was like, okay, here are the different degrees of research and teaching, and how they lend itself to one another, and what a lab basically would look like, or what the students would look like at these particular institutions which I didn’t really think about as much until I did this visit.

Findings Summary

Through CRT, the voices and experiences of minority students in STEM graduate programs can be heard, which may provide a counter understanding to dominate narratives often portrayed. The Black and Latino/a/x students in this study benefited from advisors asking about career interests, discussing career options, being a role model, and assisting with networking and
resources. When advisors asked their advisees about their career interests, they provided career guidance as opposed to advisors who did not ask but assumed. Participants benefited from discussing career opportunities with their advisors because it exposed them to various career opportunities they were not aware of. Many Black and Latino/a/x students in this study were first-generation college students and did not benefit from their peers’ social capital. Therefore, these discussions exposed participants to various options that may not have been explored if they did not receive their advisor’s information. Advisors are role models to their graduate students; students view them as positive or negative depending on how the advisees view the advisor’s behavior. It is important to note that students who viewed their advisors positively were more interested in pursuing a career in the academy. Also, the findings suggest participants benefited when advisors provided them with networking and resources that pertain to career development.

**Discussion**

Given the lack of diverse faculty in STEM, this study focused on a critical aspect of the advisor-advisee relationship for Black and Latino/a/x graduate students in STEM and explores how advisor-advisee relationships influence Black and Latino/a/x graduate students’ career decisions. Whereas previous research acknowledges the strong influence of the advisor on doctoral completion, by focusing on nineteen Black and Latino/a/x graduate students in STEM at a PWI in the Midwest, this research provides insight from Black and Latino/a/x students’ perspectives on advisors’ influence their career decisions. Through a CRT approach, we were able to capture how advisors’ actions influenced minority students in STEM. This research looks beyond degree completion, focusing on career decisions for those who complete the doctoral degree. Although Black and Latino/a/x students in this study were enrolled in various STEM academic programs, their collective experiences regarding their advisor-advisee
relationship pertaining to career influence echoed its significance in their experiences. Themes of asking about career interests, discussing career options, being a role model, and assisting with networking and resources emerged as central to how advisors influenced minority students’ career decisions in this study. Our findings support previous research that has identified advisors as the central component in doctoral students’ graduate school experiences (Bain et al., 2011; Golde, 1998; Patton, 2009).

Overall, the students confirmed that the advisor-advisee relationship influenced their career decisions. This finding was similar to Gibbs and Griffin (2013), who reported the advisor’s role may influence advisees’ individual perceptions of a career path and may impact career preferences. The results show students welcomed questions about their career aspirations and found it beneficial when advisors asked graduate students about their career aspirations. These findings were supported by Crisp and Cruz (2009), who indicated professional and career development assistance is beneficial to students. Students received direct advising about their future goals when the advisor was aware of what career path the advisee desired. Participants felt their advisors cared about them when they asked about their career interests. An advisor who did not initiate conversations with participants about career options was viewed as not supportive, which was also seen in Schlosser, et al.’s work (2003).

Although students preferred that their advisor be proactive in asking the advisee about his or her career aspirations, participants benefited from the discussion even if they started it because it provided them with an opportunity to ask questions and receive information about career opportunities. These findings were consistent with Sauermann and Roach’s (2012), who noted that advisors who talked to their advisees about the job market led to advisees who were more likely to apply for tenure-track positions. Because the majority of the study participants were
first-generation college students, their advisors’ career discussions were critical in helping them navigate the decision-making and application process. Students who had conversations about career options were able to seek additional resources to further their search for possible careers. This echoes Pinher et al.’s (2017) earlier findings which suggested advisor involvement in the job search process is crucial in academic careers.

Participants looked at their advisors’ lifestyle when questioning if academia was a career option for them. Participants whose advisors appeared to enjoy their jobs were more open to pursuing a career in academia than students who felt their advisors did not have enough time or struggled with work-life balance. Stress-related to the amount of research, politics, worried about your next grant This was similar to results from Crisp and Cruz, 2009, who found that advisors play a key role when pursuing careers at research-oriented universities (Sauermann & Roach, 2012). Students who did not prefer their advisors’ advising style expressed not wanting to be like their advisors. These participants tended to be undecided about pursuing a career as a professor. If increasing the number of minority faculty in STEM departments is an institutional goal, it may be wise for faculty to build effective relationships with their advisees and model behaviors and lifestyles that would inspire future faculty. Although students might initially enter graduate school because they want to pursue a career in academia, Sauermann and Roach (2012) find that graduate students tend to be less interested in faculty position as time progress (Sauermann & Roach, 2012; Pinher et al., 2017). Although Sauermann and Roach’s (2012) study did not explore why students lose interest, we explored how the advisor-advisee relationship evolves over time.

When advisors assisted students with professional networking, it was beneficial for advisees’ career development. Zhao et al. (2007) found that career development was a desirable
factor for students and reported students in science fields were more likely to report advisors assisted with career development than students in humanities. Participants whose advisors helped with networking were able to expand their own professional network. Participants who had a more expansive network were able to take advantage of collaborating with faculty from other institutions and build relationships with people in the industry. Advisors who introduced students to their professional networks ultimately introduced students to career options (Welde & Laursen, 2008). Building an external network allowed students to develop their identity as a scientist. When participants were able to benefit from their advisors’ networking on their behalf, it increased their chances of pursuing a STEM field career. These findings were consistent with Welde and Laursen (2008), who indicated that students who receive career guidance from their advisors tend to explore careers in STEM fields.

Resources such as teaching assistantships, faculty preparation programs, and research collaborations provided by the advisor were appreciated and beneficial. Resources assisted students in exploring career options. For instance, Caroline was able to participate in Preparing Future Faculty, which provided her with a better understanding of what it would be like to be a professor at an R2 institution. After her advisor discussed an R2 as an option, Caroline was uncertain about this career path; however, physically visiting the campus and speaking to professors gave her a better understanding of how R2 institutions operate. These institutional resources were beneficial because they helped advisees prepare for more than one career pathway (Welde & Laursen, 2008). Students who had the opportunity to teach a course were more open to pursuing an academic career. The TA experience allowed students to receive a real-life experience of what being a professor would feel like, mainly because they were teaching and conducting research simultaneously. Commonly, studies that explored the advisor-advisee
relationship did not indicate how advisors utilized institutional resources to expand students’
career options. In this study, however, resources provided by advisors assisted with career
guidance for the participants.

Conclusion

This research contributes to the anti-deficit research that focuses not on what is wrong
with Black and Latino/a/x graduate students but instead focuses on systemic issues across
graduate education and difficulties that URM graduate students face in graduate education. This
research focused on how the advisor-advisee relationships and specific advisor actions
influenced 14 URM STEM doctoral students’ career decisions at two Midwestern PWIs. Asking
about career interests, discussing career options, being a role model, and assisting with
networking and resources were identified as advisor actions that influenced career decisions for
minority STEM students in our study. Students received better advising when their advisors
were aware of their career interests. Participants whose advisors discussed career options were
able to ask questions and learn about various STEM careers. Students tended to view their
advisors as both positive and negative role models, which directly impacted their views of
research-intensive academic careers. Specifically, students who were considering academic
careers viewed the lifestyle of their advisor as a primary example. Additionally, it was beneficial
for advisors to assist their advisees with networking and resources. Participants whose advisors
helped with networking were able to collaborate with scientists from other universities and
industries. Resources allowed participants to expand their knowledge of and experience in
possible STEM careers.
Acknowledgments

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This dissertation consists of three articles that focus on the impact of the advisor-advisee relationship among minority students in STEM graduate programs at predominantly White institutions (PWIs) from the student perspective. Article one explains the thought process behind how Black women within the study selected their advisors and their perception of their relationship. Article two explored the factors that influenced the advisor-advisee relationship as the graduate student progressed through their program and how the relationship evolved. Article three investigated how the advisor-advisee relationship may influence minority STEM graduate students’ career choices. Each article connected by highlighting the importance of the advisor-advisee relationship for minority students in STEM graduate programs (Clark et al., 2016; Griffin et al., 2010; McCoy et al., 2015; Welde & Laursen, 2008).

All articles were analyzed using a critical lens for gender and race, which allowed the researcher to center the student perspective and include multiple oppressions such as race, gender, class, and history. This was extremely important because minority students tend to have a different higher education experience from White male students (Griffin et al., 2018). Their identities have been a factor (Ellis, 2001). Article one data was analyzed using Black Feminist Thought (BFT) because it allowed the researcher to focus on Black women and share their stories from their own experience, including multiple identities that have influenced who they have become (Collins, 1986). Additionally, for this particular article, BFT allowed the researcher to analyzed Black women’s experiences in PWIs from Black women’s perspectives.
Critical Race Theory (CRT) was used to analyze articles two and three. Articles two and three focused on minority students (African Americans, Mexican-Americans, Native Americans, Pacific Islanders, and mainland Puerto Ricans); CRT allowed the researcher to analyze the data to capture different stories and experiences (Bell, 1995; Delgado and Stefancic, 2017; Hiraldo, 2010). The researcher was also able to focus on both race and racism while it challenges traditional paradigms from of perspective minority students.

**Article I Summary**

This article explored how and why Black women in STEM doctoral program selected their advisor and their perceptions of the advisor-advisee relationship. This study’s findings supported Borum and Walker,( 2012) and Charleston et al.(2014) by indicating that the advisor is critical to Black women in STEM graduate programs. Like other students, Black women in this study selected their advisors for various reasons; compatibility, lab availability, research interest, funding, and faculty interest in working with students. However, Black women should consider the advising style of the advisor before making a selection.

All participants preferred their advisor to have a hands-on approach. Selecting an advisor with a hands-on advising style may be easier if students participated in a lab rotation prior to making their decision (Golde, 2007; Maher et al., 2019). This method gives students the ability to obtain a feel for the research, environment/culture of the lab, and the advisor’s daily role (Maher et al., 2019). A lab rotation may be beneficial because the participants did not know what was needed to be a successful graduate student, making it difficult to understand what was needed from an advisor.

We found participants who preferred their advisors’ advising style tended to perform better academically and made better progress within their program (Lechuga, 2011; McKen,
2019; Rasheem et al., 2018). Students in this study who preferred their advisor’s advising style were more comfortable expressing their questions and concerns with their advisors (Rasheem et al., 2018; Wrench and Punyanunt-Carter, 2005). Conversely, students who did not prefer their advisor’s advising style felt they lacked guidance and reported they struggled more with navigating through their programs (more than participants who preferred their advisors’ advising style) (Cole & Espinoza, 2008; Inman et al., 2011). They also expressed their struggle with the research portion of their program as a result. Participants whose advisors did not provide them a research topic or questions were considered hands-off, which is not a preferred advising style. Some participants wanted their advisors to give them a project. Participants who tended to be neutral about their advisors’ advising styles reported no change with the advisor-advisee relationship. This code was often not often used; typically, students either preferred or did not prefer their advisors’ advising styles. Not often are students without an opinion about their relationship with their advisor and have strong opinions about their advisors’ advising styles; therefore, these results are not surprising.

Overall, our study found communication between the advisor and advisee is essential to the student’s progression and degree completion (Goldman & Goodboy, 2017). Having a clear understanding of the advisors’ expectations and an open communication line could help students navigate unforeseen circumstances. Students need to feel comfortable expressing their needs, feeling understood, and having explicit (rather than implicit) expectations (Barnes, 2009; Inman et al., 2011). The prevalence of implicit/unspoken expectations and needs leads to frustration, lack of progress, and poor relationships. Many needs and expectations are often unspoken. If students do not verbally state their needs and if advisors are not capable of identifying when their students have needs, unfortunately, the relationship may not work.
Article II Summary

This study explored the relationship between minority students and their advisors over time and the perceived factors contributing to relationship changes. A longitudinal approach was used to analyze the advisor-advisee relationship from the students’ perspective over three years. This study’s findings indicated that the advisor-advisee relationship could change over time (Schlosser et al., 2003). For most participants, the advisor-advisee relationship changed for the better, but unfortunately, a few students reported their relationship changed for the worse. Four reoccurring themes influenced the advisor-advisee relationship’s change over time; accessibility, time, trust, and communication.

Accessibility was important to students within this study. Advisors who were accessible were described as helpful and supportive (Bloom et al., 2007; Griffin et al., 2018). When advisors are available, they provide students with feedback, answer questions related to research, and felt comfortable in the lab (Welde & Laursen, 2008). Students who reported their advisors were not accessible, lacked guidance (Richmond, 2019), did not feel comfortable in the lab (Maher et al., 2019), and did not spend time with their advisors. Although the findings were similar to Schlosser et al. (2003), who indicated students benefited from an accessible advisor, they focused on graduate students in psychology; this study adds to the literature for minority students in STEM graduate programs.

Students’ time with their advisors influenced how their relationship developed with their advisors (Griffin & Reddick, 2011). Students who spend time with their advisors understood their advisors’ thought processes and reported effective communication. Additionally, students were able to take constructive criticism from an advisor they spend time with. Rasheem et al. (2018) said more interactions with advisors led to productive relationships for Black women; we
add that it is beneficial for other underrepresented students. Participants in our study reported that time spent with advisors led to support, guidance, effective communication, comfortability discussing personal concerns, and developing a working relationship with their advisor. Students who did not spend time with their advisors felt their advisors did not provide guidance and lacked interest in their research and development as a student. Time is significant for STEM students because of the amount of research produced before completing their program. Also, students tend to learn many research skills from their advisors if they spend time in the lab (Maher et al., 2019).

Trust impacted the advisor-advisee relationship over time. Previously, Offstein et al (2004) reported trust is critical between the advisor and advisee, and the findings in this study confirms it. When advisors demonstrated or verbally expressed their trust in students, students appreciated. Students whose advisors trusted them self-esteem was higher, and they demonstrated confidence in the lab. Unfortunately, trust is not always demonstrated, especially for minority students. Commonly, minority students are viewed as unprepared for graduate-level work (Spraggins, 1998).

Communication was a key component to the development of the advisor-advisee relationship over time. Participants who preferred their advisors’ communication style developed a stronger relationship with their advisors (Rose, 2013). Participants who felt comfortable communicating with their advisor stated they received more guidance and felt more comfortable talking about challenges they encountered professionally and personally (Punyanunt-Carter and Wrench, 2008). Participants indicated that they learned how to communicate with their advisors over time, which strengthen the relationship. Inman et al (2011) suggested that students tend not to disclose information with their advisor if they are not
satisfied with their relationship. Students who prefer their advisors’ communications style tend to navigate more smoothly than a student who struggles. Ultimately, participants indicated a lack of interest made them feel as if their advisor was not interested.

Summary of Article Three

Article three examined how advisors influenced minority STEM graduate students’ career decisions from the students’ perspective. Based on prior studies, the advisor-advisee relationship is beneficial to students in STEM graduate programs (Griffin et al., 2018; Welde & Laursen, 2008). The findings from this study illustrate how the advisor-advisee relationship influences graduate students’ career decisions. Four reoccurring themes influenced how advisors impacted their advisee career decisions; asking about career interest, discussing career options, being a role model, and assisting with networking and resources.

This study indicated that advisors must ask their advisee about their career interests. Advisors can provide detailed advice for the advisees when they know the career path their students desire (Rasheem et al., 2018; Tillman, 2001). The participants in this study reported they felt their advisor cared about them when they asked questions about their future (Crisp & Cruz, 2009). Unfortunately, it is not a universal practice for an advisor to ask about career interests. When advisors do not ask about career aspirations, it limits their ability to assist students because they are unaware of their career goals. Students felt their advisors were not supportive when they did not ask. Fuhrmann et al. (2011) indicated that not all advisors assist students with career options. However, this study findings suggest minority students in STEM benefit from having conversations about careers because these conversations expose students to various questions, create a comfortable environment to ask questions and provide information that helps the advisor properly guide the advisee.
Many minority students in graduate STEM programs benefit from having discussions about career options (Griffin et al., 2018). This study findings suggest advisors who discussed career opportunities with their advisee exposed them to different options they were not aware of. These discussions were critical for minority students, specifically because many are first-generation college students. In this study, students who had these conversations with their advisors were exposed to different careers; research institutions, industry, and entrepreneurship (Pinheiro et al., 2017). Additionally, the advisor provided students with suggestions on identifying opportunities, when to start looking, and who to speak with. These tips were critical to URM students who had no prior knowledge of these opportunities. Unfortunately, when advisors did not talk to students about career options, students felt uncertain and did not receive answers to unknown questions.

The findings in this article indicated advisors are role models for their advisees. Depending on the actions of the advisor, advisors can be positive or negative role models. It is essential for faculty to understand that their actions matter in the presence of their advisees. This study’s findings support Kram (1985), who reported mentors could enhance career development by being a role model for their advisees. The participants in this study looked at the advisor’s actions and lifestyle when considering a career in academia. Students whose advisors enjoyed what they did were more open to a job in the academy. However, students who felt their advisors were overworked, had little time for their families, and did not show passion about being a professor were not interested in pursuing a career as a faculty member. Since increasing minority faculty in STEM departments is a concern at many institutions, it may be beneficial for students to see a positive role model from their advisors.
Participants in this study benefited from their mentor providing them with resources and assisting with networking. These findings supported Rasheem et al. (2018) found that mentors who exposed students to resources such as employment, conferences, and networking enhanced their students’ success. In our study, students who advisors provided them with resources could explore opportunities that aligned with their career interest. For instance, a student was interested in a faculty position at a research two institution. With her advisor’s support, she participated in a program that allowed her to learn about the particular type of institution and participate in a campus tour. Advisors assisted students with networking by introducing them to experts in their field and arranging collaboration projects. Students were able to make connections with faculty from other institutions and professionals within the industry. Collaborations led to students feeling comfortable speaking to scientists while using scientific terminology.

Overall, this study’s findings indicated the advisor-advisee relationship impacts minority STEM graduate students’ career decision. Our findings supported research that stated the advisor is a critical component to the predictor of career commitment (Felder, 2010; Gooden et al., 2020; Paglis, et al., 2006; Prime et al., 2015). As the most influential person, advisors provide graduate students with lab training and career advancement. When advisors provide students with mentoring that assist with career guidance, it gives them access to spaces that have been historically not available to minority students. This study shows it is beneficial for minority students’ advisors to ask about career options, discuss career options, be a positive role model, provide students with resources that assist with career interest, and help with networking.
Recommendations

Based on the research findings, the first recommendation this dissertation supports is that it is vital for minorities in STEM graduate programs to select an advisor with their preferred advising style. In this dissertation, some participants described their advisors as supportive and hands-on, while others expressed their advisors not supportive and hands-off. Many faculty members have little to no training in mentoring graduate students before becoming faculty members; therefore, they may benefit from knowing what characteristics impact completion rates. It should be mandatory for faculty to participate in culturally-responsive mentoring to ensure they are prepared to mentor all students. Additionally, faculty should be aware of what is needed to build a productive relationship. I recommend that advisors meet with students’ weekly, especially at the beginning of their program. Regular meetings will allow students to build effective communication skills, ask questions, develop needed lab skills, and help navigate their programs. Faculty should provide minority graduate students with career guidance and intentionally expose students to various careers and resources. Also, faculty should ask students about the future career aspirations and build the skills needed to be successful within the particular student field. Faculty should also introduce students to experts in their field and allow students to participate in research collaboration if possible.

Since we know the importance of selecting an advisor, students should be provided with resources prior to making that decision. I recommend a workshop that will provide students with essential characteristics to consider before deciding. Due to each program and discipline requiring different support levels from advisors, departments should provide students with a workshop that focuses on important characteristics to consider when selecting an advisor for their discipline. Also, students should have the opportunity to participate in a lab rotation,
allowing them to feel the advisor’s advising style, lab environment, and research topic. Students benefited from resources that allowed them to explore various career interests.

**Future Research**

Future research should begin with replicating the three studies using more participants nationwide. A more in-depth analysis for Black women in STEM programs is needed. A study that includes more black women will provide more information about how and why Black women in STEM graduate programs select their advisors and the impact of their decision over time. If the effect of their decision is understood, we as educators will assist the next generation of Black women in STEM graduate programs. Studies on Black women should use critical frameworks that would allow the researcher to include multiple identities, which have been historically oppressed when exploring the experiencing of Black women in White spaces.

The studies in this dissertation explored minority students in their graduate program for up to three years. Future research should examine minority student’s advisor-advisee relationships over their entire time in their program. A longer time will give a more accurate description of the advisor-advisee relationship changes over time. A study that examines for a longer time will have more insight on which factors contribute to the change and why. Future research will explain which factors contribute to a productive relationship that positively relates to the trajectory. A critical lens for future studies is imperative because many minorities’ experiences are subjected to various daily intersectionality.

Future studies should focus on how the advisor-advisee relationship impacts students’ career decisions. Studies should explore if students with a positive relationship with their advisors are more likely to pursue a faculty position in a STEM department. This is critical because the number of minorities in a STEM faculty position is extremely low. Therefore,
understanding how the advisor-advisee relationship influences career decisions can increase minority faculty representation globally. Additionally, studies should also explore the impact of resources and networking provided by the advisor. Our study covered a small part, but more information is needed.

Acknowledgments

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APPENDIX
HSIRB Approval Letter

Date: June 19, 2014

To: Megan Grunert, Principal Investigator
    Jocelyn Steinke, Co-Principal Investigator
    Susan Stapleton, Co-Principal Investigator

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 14-06-16

This letter will serve as confirmation that your research project titled “AGEP: BPR: Understanding URM STEM Graduate Students’ Identity Integration and Assimilation into a Community of Practice” has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: June 18, 2015