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Culturally Responsive Leadership and Distributed Leadership Practices in a STEM School

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Walden University

2020

Abstract

Culturally Responsive Leadership and Distributed Leadership Practices

in a STEM School

by

Cynthia N. Bradley

M.S., University of Memphis, 2008

B.S., Crichton College, 2001

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Education

Walden University

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Abstract

Culturally responsive leadership practices and distributed leadership are strategies that could aid racially diverse students to become successful in STEM courses and later in a STEM field. The purpose of this study was to explore culturally responsive leadership practices and distributed leadership within a STEM school to support racially diverse students. Distributed leadership and culturally responsive leadership practices were the conceptual frameworks of the study used to explore the rationale for the decision-making within a school. The research questions addressed the challenges and opportunities of implementing culturally responsive leadership practices and distributive leadership to enhance the diversity of students in a STEM school. Qualitative case study interviews of 1 administrator and 6 teacher leaders, observations of classrooms, and artifacts of school documents were used to collect data. The emerging themes from the data analysis included collaboration among faculty, striving for positive interactions with students, community outreach to parents, technology to support communications to diverse parents, language differences, cultural issues within the diverse student body, and student motivation, preparation, and absenteeism. The findings from the study may contribute to positive social change by bringing awareness of the support needed for a diverse student population.

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Dedication

I dedicate this dissertation to my loving family, my mother Causaundra, my father Calvin, and my sister and brother Christina and Cameron for their patience and support during my doctoral journey. A special thank you to my mother for being an inspiration and setting forth the pathway for me by completing her doctoral journey over 20 years ago. She is the reason for my perseverance and resilience. Most importantly, to my Lord and Savior Jesus Christ, you have made my dreams a reality.

Take delight in the LORD, and he will give you the desires of your heart.

Psalms 34:7

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Chapter 1: Introduction to the Study

Racially diverse high school students in the United States are lagging in their participation in courses in Science, Technology, Engineering, and Mathematics (STEM) fields, such as computer science, engineering technologies, mathematics, or physical science, and administrators may be searching for strategies to support students in secondary schools who are transitioning to college and are searching for a major to study in their undergraduate education. Bachelor's degrees awarded to African American, Hispanic, American Indian, and Pacific Islander students had a lower percentage rate in the STEM fields than White or Asian students in the same fields (U.S. Department of Education, National Center for Education Statistics, 2017b). The enrollment of racially diverse students in the public secondary and charter schools has increased, while the enrollment rate of White students has decreased from 61% to 49% (U.S. Department of Education, National Center for Education Statistics, 2017a). The number of African American, Latino, and Native American students are disproportionately low in the STEM fields (Maton, Domingo, Stolle-McAllister, Zimmerman, & Hrabowski, 2009), and there is a need for diversity to be reflected in those who choose STEM careers. Culturally responsive leadership practices recognize the incorporation of the culture, values, and history of the student's home community embedded in a school curriculum to develop critical consciousness to challenge society (Jacobson & Johnson, 2011). Schools with a multicultural focus can value diversity by implementing a culturally proficient vision, provide the support for the organization to understand the culture, and model the cultural knowledge for the practices of the school and classroom practices (Malakolunthu, 2010).

The responsibility for the establishment, guidance, and success of an accepting school environment for a diverse group of students is part of the role of the administration (Minkos et al., 2017). A school that offers a STEM curriculum allows students to gain experience in fields, such as engineering, computer coding, and biomedical science. Schools that have a high percentage of Black and Latino students have been found to offer less access to mathematics and science courses, such as calculus and physics, than schools that have low Black and Latino enrollment (U.S. Department of Education, Office for Civil Rights, 2016). Computer science, engineering, and technology courses were found to be more accessible at high schools than middle and elementary schools (Dalton, Ingels, & Fritch, 2016). The knowledge that can be obtained from these fields can prepare students for careers, such as medical physicians, aerospace engineers, or climate change analysts. The focus of this study was on the administrators and teacher leaders of successful STEM schools because they may have an understanding of the strategies that will allow other racially diverse students to flourish in a society that has a focus on the 21st century careers. In Chapter 1, I provide the background, research problem, purpose, conceptual framework, nature of the study, the limitations of the study, and the significance of the study.

Background

Administrators are instrumental in creating a safe learning environment and guidance for the education of racially diverse students (Minkos et al., 2017).

Administrators who use culturally responsive leadership practices and distributed leadership may be more successful in supporting a diverse student body to study the

STEM fields. Culturally responsive leadership practices are derived from the methods of culturally relevant pedagogy that includes strategies that support an ethnically diverse student body (Johnson, 2014). Culturally relevant pedagogy has a focus on cultural competence, academic success, and the critical consciousness of society (Ladson-Billings, 1995a). The term *culturally responsive* refers to a collaborative relationship between the home/community culture and the culture of the school (Ladson-Billings, 1995b). Culturally responsive leadership practices can include parental involvement, shared beliefs, leadership, professional development, and pedagogy (Mayfield & Garrison-Wade, 2015). Distributed leadership is a conceptual model that uses collaborative effort between the administration and teacher leaders of the organization and has a focus on educational processes and student outcomes (Hallinger & Heck, 2009). Teacher leaders have a prominent role in distributed leadership because the theory has a focus on the empowerment of a group of individuals at a school that guide the instructional change process, shared agency, and collective action (Harris, 2003b).

There has been a demographic imbalance in the STEM sector among non White individuals, and providing diversity could bring innovation in the sciences for a competitive society (Daily & Eugene, 2013). I found no research exploring the role of culturally responsive leadership practices implemented with distributed leadership in a STEM school. In this study, I addressed the culturally responsive leadership practices that are performed in a diverse school that supports a STEM curriculum.

Research Problem

Due to the need for diversity, some school organizations are creating opportunities for students to become successful in studying STEM fields before becoming part of the workforce (Daily & Eugene, 2013). Administrators and teacher leaders may acknowledge the obstacles and differences that racially diverse students' experience as deterring them from pursuing a career in the STEM workforce and choosing to take STEM classes in school. When implemented into the daily culture of an institution, culturally responsive leadership practices may support the disparities racially diverse students experience that prevents their success in a STEM school. Without an adequate understanding of how culturally responsive leadership practices and distributed leadership practices may support a racially diverse student body in a STEM school, school administrators may be missing opportunities to address their schools' visions and missions.

Purpose of the Study

The purpose of this case study was to explore the perceptions of administrators and teacher leaders using culturally responsive leadership practices with distributed leadership in a STEM school with a diverse student population. Analysis of the relationship and interactions between the administrators and teacher leaders and the implementation process of culturally responsive leadership practices and distributed leadership could provide an understanding of the curricular and pedagogical strategies and techniques that meet the needs of racially diverse students in a STEM school. Finally, an examination of the implementation of the culturally responsive leadership

practices and distributed leadership inside of an organization could lead to a better understanding of the difficulties, challenges, and opportunities school leaders experience in guiding students in a diverse, STEM school culture.

Research Questions

1. What culturally responsive leadership and distributed leadership practices are used by administration and teacher leaders to increase the diversity of students choosing STEM classes in a racially diverse STEM school?
2. What are the challenges and opportunities in implementing distributed leadership and culturally responsive leadership practices to encourage more students of color to participate in courses in a STEM initiative curriculum?

Conceptual Framework

The conceptual framework of this study comprised culturally responsive leadership practices and distributed leadership. Culturally responsive leadership practices are strategies that empower the parents of students from a diverse background, support the culture in the home, promote community involvement of poor and diverse neighborhoods, and advocate for the change of society on a large scale (Johnson, 2007).

The implementation and decision-making process is imperative to the success of a diverse student body. Distributed leadership provides leadership that is shared among the school leaders, and the expertise of the stakeholders increases because the knowledge of the school administrators is shared (Erol & Turhan, 2018). Through distributed leadership, school leaders can create and cultivate peer-led professional development, curriculum decisions, and the development of interdisciplinary pedagogy for the success

of the student body (Davison et al., 2014). I will provide a more detailed explanation of culturally responsive leadership practices and distributed leadership in Chapter 2.

Nature of The Study

In this study, I used a qualitative single case study approach to understand how culturally responsive leadership practices and distributed leadership influence a diverse student population enrolled in a STEM school. The participants for the study included one administrator and six teacher leaders who support distributed leadership in the STEM school. According to Patton (2015), a case study allows the focus of the research to be on a different part of an organization, individual people, or participants in a program. Patton also noted that case studies give the researcher an opportunity to create a specific focus on their field and inquiry. Case studies rely on several sources of evidence supported with data and offer the understanding of a real-world event (Yin, 2018). The case study approach aligned with the research questions of this study because it allowed for the exploration necessary to develop an understanding of culturally responsive leadership practices and distributed leadership for racially diverse students attending a STEM school. I collected data for this study from interviews, observations, and the review of school documents relevant to culturally responsive leadership practices and distributed leadership. In Chapter 3, I will provide more information on the research methods of the study and the rationale for the data collection and analysis process.

Definitions

The following definitions are important to understanding the terms used in this study:

Academic success: A broad spectrum approach to define a range of moral development, degree attainment, or educational outcomes (York, Gibson, & Rankin, 2015).

Administrators: The role of the administrators includes creating safe and productive learning environments for educators and the student body (Minkos et al., 2017).

Cultural competence: A set of policies, behaviors, and attitudes in an organization that work effectively in situations that are cross-cultural (Cross, 1988).

Culturally responsive leadership practices: The methods that administrators use to support the values, history, and cultural knowledge of the communities of the students from a diverse background (Johnson, 2007).

Culturally responsive pedagogy: Methods that embrace the ideas of the home and culture of students that have limited academic success (Garcia & Garcia, 2016).

Distributed leadership: Leaders using collaborative efforts to resolve implementation decisions that can lead to an effective outcome (Jones & Harvey, 2017).

Diversity: Similarities and differences that exist between the identities and worldviews of a group in society, community, workplace, or classroom (Comerford, 2004).

Science, technology, education, and mathematics (STEM) education: An interdisciplinary field that supports the disciplines of science, technology, education, and mathematics (Burrows, Lockwood, Borowczak, Janak, & Barber, 2018).

Teacher leaders: Teachers who assume formal or informal leadership roles to support classrooms and the student body in such ways as a resource provider, curriculum specialist, learning facilitator, mentor, data coach, or school leader (Harrison & Killion, 2007).

Assumptions

I made several assumptions in this case study. The first assumption was that the participants were able to reflect on culturally responsive leadership practices and distributed leadership, leading to a productive interview. I asked the participants about the conceptions they may have about culturally responsive leadership practices and distributed leadership to aid with the perceptions of the terminology. Another assumption was that I was welcomed as a researcher and the participants would be authentic with me in the interviews. In the past, I have had experiences where school leaders were surprised that I, a STEM teacher myself, am a person of color. I arranged the interviews by e-mail before I traveled to the data collection site and the participants did not know my race. The administrators and teacher leaders were accustomed to different races, but some of the participants may not have agreed with the idea of an African American woman working toward a doctorate. These assumptions were necessary for the context of the study because they may have posed a risk for the ability to collect accurate data from the participants.

Scope and Delimitations

The participants of this study included the principal, vice principal and six teacher leaders in an urban STEM academy that implemented a STEM curriculum to racially

diverse students. The focus of the study was the implementation of the culturally responsive leadership practices and distributed leadership used by the administration and teacher leaders of the STEM academy rather than studying a school that has failed to implement such practices. Gathering the perceptions of the administrators and teacher leaders on the culturally responsive leadership practices and distributed leadership was helpful in understanding the support racially diverse students need in education.

Not explored in this study were the parents and children in the STEM school. The focus was the support the administrators and teacher leaders offered the students of the STEM school because of the need for diversity in the STEM workforce. The parents and children may not have been willing or available to offer the information needed to support the study.

One boundary in the conceptual framework that was not explored was transformational leadership because its aim towards creativity and change may be difficult to measure in a brief qualitative study. Distributed leadership supports the decision-making process in an organization so that it may better benefit students (Hallinger & Heck, 2009). The potential transferability of the findings of this study was applicable to schools with different organizations or religious affiliations, such as a magnet or charter schools including Muslim, Catholic, or Islamic schools.

Limitations

Limitations of the study may result from the chosen research design, personal bias, and the unwillingness of the participants to provide honest responses during the interviews. The research method and design were limitations because the findings are

limited to a case study in the setting of one STEM academy. Although school leaders may consider the applicability of the findings to their own setting, the research method may not be transferrable to another school. In addition, the study duration of 1 week may have limited my ability to collect the data needed to address the research questions more thoroughly.

Personal bias may have arisen in this study because I am a STEM educator. I attempted to reduce my personal bias by getting assistance in writing unbiased interview questions from my dissertation committee members, listening carefully to the participants, and keeping a researcher's journal in which, I reflected possible bias before completing the interviews. The interview questions allowed the participant to focus on their experiences and personal thoughts, and my own attitudes and behavior were limited.

An additional limitation was the participants' possible unwillingness to be truthful during the interviews. Each participant received a gift card for conducting the interview, and they may have participated only for the incentive and not have been as truthful as the other participants. A strength of interview questions is the focus on the topic of the case study and a possible weakness of an interview is the response bias and inaccuracies that occur due to the participant being unable to recall the information and telling the interviewer the information the researcher wants to hear (Yin, 2018).

Significance

Examining the influence of culturally responsive leadership practices and distributed leadership in a STEM school with a diverse population may be helpful to the district leaders, administrators, teacher leaders, teachers, and other stakeholders interested

in strategies to support students from diverse communities. There is a demand for diversity in STEM careers because of the need for labor that can affect the economic and national security development of the United States (Jones et al., 2018). Jones et al. (2018) noted that students of color, women, and with lower socioeconomic status are the groups that need support for academic achievement. The potential contributions of this study include promoting the awareness of the strategies and support racially diverse students need to become successful students. Another potential contribution is the development of future programs within an organization based on the culturally responsive leadership practices and the support needed for teachers to understand the importance of using distributed leadership in a school that may want to grow leaders within an organization. Other potential implications for social change are the more effective discussions and strategies used among administrators, teacher leaders, and stakeholders that could occur due to the implementation of strategies that aid a diverse student body representative of the demographic shift within the country to pursue STEM careers.

Summary

Administrators and teacher leaders of school organizations offer racially diverse students the opportunity of becoming successful in STEM courses to support the need for a workforce skilled in technology-related fields. Culturally responsive leadership practices and distributed leadership are strategies administrations, teacher leaders, or organizations can use to broaden the aid of a racially diverse population. This study contributed to filling the gap in the research to better understand how to support racially

diverse students as well as the role of administrators and teacher leaders when incorporating opportunities within an organization.

Chapter 2 will include an analysis of the conceptual framework of culturally responsive leadership practices and distributed leadership as well as a literature review of empirical research related to the support of racially diverse students in a STEM school, the impact of distributed leadership for social change and teacher leaders, the obstacles and benefits of culturally responsive leadership practices, and the experiences of students in STEM education.

Chapter 2: Literature Review

Studies have indicated that culturally responsive leadership practices can improve the achievement gap between Black and White students (Mayfield, 2014), promote the history and culture of the students within a curriculum (Ylimaki & Jacobson, 2013), support the parental involvement for a community (Johnson, 2007), and create an environment for racially diverse students to witness their culture valued in school (Ford, 2013). Studies of culturally responsive leadership practices have been conducted in several environments, such as after school programs (Simpkins, Riggs, Ngo, Ettekal, & Okamoto, 2017), urban computer science programs (Charleston, Charleston, & Jackson, 2014), teacher preparation programs (Immekus, 2016), and online universities (Heitner & Jennings, 2016). However, I found no studies conducted on administrative use of culturally responsive leadership practices and distributed leadership to promote diversity within a STEM education program. The purpose of the study was to understand the culturally responsive leadership practices that administrators used in a STEM school with a diverse population to support the success of the students and the impact of distributed leadership within the organization.

The demand for skilled professionals in the STEM field in the United States is due in part to the challenges of environmental protection, economic growth, climate change, and national defense as well as the need to fill the positions to meet the growing societal demands of technology (Boyce, 2017). Diverse student populations, including nonnative English speakers or nonnative standardized English speakers, can face experiences of cultural diversity, linguistics, or academic inequalities that hinder their

success in STEM education (Mallinson & Hudley, 2014). The implementation of culturally responsive leadership practices by the administration could aid in the success of a diverse student population when racially diverse students face these difficult experiences in a STEM education. Culturally responsive leadership practices include creating a learning environment within the curriculum that incorporates the knowledge, history, and values from the home of the student while supporting the cultural consciousness of the society and empowering parents from surrounding communities (Ylimaki & Jacobson, 2013). A culturally responsive leader promotes high expectations for academic achievement, encourages the culture of the student body and parents from diverse and disadvantaged neighborhoods, and advocates for change within the society for a better community (Johnson, 2007).

This literature review begins with an explanation of the literature search strategy followed by an analysis of the conceptual framework that was based on Hallinger and Heck's (2009) work on distributed leadership as well as an exhaustive review of the literature, which includes an analysis of culturally responsive leadership practices and STEM related to the components of this study and how a gap in the literature will be addressed. Hallinger and Heck noted that distributed leadership is a practice that allows administrators to spend the time needed to support students with their endeavors and spread the leadership duties to teachers to create an environment for change within an organization. Distributed leadership can support the school improvement necessary for school leaders and teachers to have a work environment that embraces strong collegial

interactions, support among colleagues, mutual trust, and exploration (Harris, 2003a; Mascall, Leithwood, Straus, & Sacks, 2008).

Literature Search Strategies

The primary database used to complete an exhaustive review of the literature on the topic under study was the Thoreau-Multi Database provided by the Walden University Library. In addition to the Thoreau-Multi Database, I used the Education Source, ERIC, SAGE Journals, SAGE Knowledge, Science Direct, National Science Foundation, NCES Publications, ProQuest Central, and Dissertation and Theses from Walden University databases to search for relevant literature. Google Scholar was also used as a primary search engine to locate journal articles. The following search terms (and combination of terms) were used: *culturally responsive practices, culturally responsive pedagogy, culturally responsive leadership practices, challenges of culturally responsive leadership practices, culturally relevant pedagogy, professional development, benefits of culturally responsive leadership practices, diversity, diversity in education, diversity in STEM education, STEM education, computer science, mathematics education, engineering education, indigenous leaders, teacher leaders, challenges, barriers, obstacles, teacher leaders, distributed leadership, professional learning communities and academic success.*

The search process began with the topic of STEM and the benefits of STEM education to racially diverse students. I explored those factors and found articles about the impact of the diversity in STEM education and culturally responsive practices in educational settings. I reviewed books and journal articles about the related studies and

found distributed leadership as a pathway for administrators to support students in a STEM program. The search process for culturally responsive practices in the ERIC and Educational Source databases and the broad topics allowed for the retrieval of peer-reviewed articles during the relevant timeframe. As the search continued, I found that there were a limited number of articles on the challenges and benefits of culturally responsive practices in STEM education, and this resulted in the use of different databases to search for information to complete this exhaustive literature review.

Conceptual Framework

Culturally responsive leadership and distributed leadership comprised the conceptual framework for this study. Culturally responsive leadership has evolved from culturally responsive pedagogy, which includes leadership policies, practices, and philosophies that can create a learning environment for parents and students from diverse backgrounds (Johnson, 2014). Culturally responsive leadership creates a school culture and climate that supports positive student outcomes for marginalized students (Khalifa, Gooden, & Davis, 2016). Culturally responsive leadership can also support the values, beliefs and culture of students in an educational setting without the assimilation of the native customs (Magno & Schiff, 2010).

Distributed leadership involves the shared responsibility of tasks among leaders for the successful completion of a task that is substantial for one person. Harris and Spillane (2008) noted that the model of distributed leadership has a focus on representation power within an organization due to the increased pressures on the administration to complete duties and some schools' efforts to restructure the leadership

teams to accommodate the demanding tasks. Harris (2009) stated that there is a positive correlation between student achievement, self-efficacy, and motivation and the involvement of teachers who make decisions within the school using the distributed leadership framework.

According to Spillane (2005), distributed leadership has a focus on leadership practices and not the roles of the individuals involved in the decision-making process. Gronn (2008) argued that the definition of distributed leadership be redefined to align the meaning to power and democratic leadership within organizations. Gronn further suggested that distributed leadership is rarely linear during the developmental stages and improvements are needed in the areas of the conceptual and empirical aspects. Harris (2007) argued that distributed leadership has a theoretical, empirical, and normative frame that are represented simultaneously and should be separate. The theoretical frame is based on several authors using various theories to define distributed leadership. The empirical frame refers to the impact of distributed leadership, and the normative frame demonstrates the leadership distribution between leaders. Leithwood et al. (2007) suggested that the individuals involved in the decision-making should understand the situation and how it can impact and affect their behavior towards each other. I used distributed leadership and culturally responsive leadership as the conceptual framework for this study to gain an understanding of the perception of administrators and teacher leaders implementing a STEM initiative in a culturally diverse school.

Culturally responsive leadership and distributed leadership had been applied in previous research to predict the possibility of school violence and school climate.

Culturally responsive leadership practices can create a school environment that is centered around nonviolence and peace (Cavenagh, 2008). These types of practices can support a democratic education by supporting environments that allow students to experience the opportunity to become a better version of themselves and enriching the lives of poor, ethnic minority students (Davis, 2002). Bellibas and Liu (2018) found that there was a positive correlation between distributed leadership and a positive school climate that included trust and mutual respect. Distributed leadership has been applied to settings other than education, such as the healthcare context. Chreim and MacNaughton (2016) found that in clinical settings, distributed leadership helped to define the roles of a clinical director and the program manager to provide adequate patient care. Distributed leadership can also be beneficial to a growing small business, but it is imperative that the entrepreneur remain the focus of the business and create leaders within the organization for empowerment and a culture of participation for employees (Kempster, Cope, & Parry, 2011).

The current study benefited from the use of culturally responsive leadership and distributed leadership as part of the conceptual framework because the STEM initiative implemented at schools have several components, such as science content, robotics, or biomedical engineering, that need support from the administration and teacher leaders to contribute to the success of the students. Culturally responsive leadership and distributed leadership can create a social and collaborative environment that relies of the efforts of a team for successful implementation of the components of a STEM initiative.

Empirical Literature Review

In this section, I analyze research on the types of culturally responsive leadership practices used in education as well as distributed leadership practices that create a collaborative environment for administrators and teacher leaders in a school, particularly those with a STEM initiative. I also focus on the individuals and components of distributed leadership and culturally responsive leadership practices that could support diversity in a STEM school.

Culturally Responsive Leadership Practices in Education

Culturally responsive leadership practices have been found to support the customs of the community (Ford, 2013; Genao, 2016; Johnson, 2007). Through interviewing 111 teachers and administrators in two school districts in Texas and Michigan, Nelson and Guerra (2014) found that only 4% of the participants identified themselves as culturally responsive or culturally aware. Those participants described one of the best practices of culturally responsive leadership as limiting the deficit views of the students attending the school as well as their parents. Deficit views are the beliefs that certain groups of students have limited ability or lack of background knowledge (Nelson & Guerra, 2014). Eighty-three percent of the teachers in their study self-identified as having little to not much cultural awareness, and the teachers attributed their lack of cultural awareness due to lack of experiences, ability, or ineffective instruction. The culturally responsive leadership practices that the culturally aware school leaders believed were the aspects to provide culturally responsive solutions for lack of cultural awareness benefited teachers and leaders through exhibiting their knowledge of cultural competence. Battey and

Franke (2013) agreed with Nelson and Guerra regarding deficit views, which they stated can exist within the teacher population and can be used to begin to have conversations with teachers about these views.

Nelson and Guerra (2014) found that a lack of deficit perception by the faculty, parents, and the community was a focal point in implementing culturally responsive practices within a school. In a case study of one school, Mayfield (2014) also found involving parents respectfully was important along with five other culturally responsive practices: culturally responsive leadership, pedagogy, learning environment, student management, and shared beliefs. According to Mayfield, the parents of the school were allowed to participate authentically in school activities and were able to share that the culturally responsive beliefs of the teachers and staff should be for the students to become successful. The discourse of race and bias are important in the classroom, and the culture of the student has an impact on the education of the student body (Mayfield, 2014). With the implementation of culturally responsive practices at the school Mayfield studied, the leadership was able to create an environment that empowered the stakeholders to share their power and status within a school organization.

Benefits of culturally responsive leadership practices in education. Although there are many challenges and obstacles, implementing culturally responsive leadership practices has been found to support positive relationships and academic learning (Simpkins, Riggs, Ngo, Vest Ettekal & Okamoto, 2017). A case study of an administrator and the culturally responsive leadership practices implemented was conducted by Madhlangobel and Gordon (2012), and they found that the practices

reflected the principal's philosophy of education corresponded to six types of practices implemented for the support of the students. Madhlangobel and Gordon found that six practices reduced a power struggle within the school that may otherwise have developed into resistance among the staff and students.

The practices began with teachers caring for others and having a deep understanding of partnerships and a desire to see culturally and linguistically students succeed. She demonstrated the characteristics by consistently sharing information, supporting the perspectives of parents, and allowing parents to complete classroom observations to support learning. The researchers also found that the second practice was to build relationships and believed that positive interactions were an essential element in supporting the education of the student. Building relationships reduced the anxiety of students and teachers and supported trust among the student body.

The persistence of the administrator allowed teachers to support the students with new ideas, teacher collaborations, and delegating responsibilities. The fourth practice supported communication and being present for collaborative walk-throughs. The walk-throughs supported the practices of other teachers and allowed the educators to witness practices and incorporate them into the classroom. To support the culturally responsive leadership practices within the school, the administrator models the practices and participates in the classrooms of the teachers. The final practice is to support culturally responsive leadership practices among individuals within the school and to be responsive to each other for encouragement.

Boneshefski and Runge (2014) addressed the disproportionately frequent discipline practices of ethnic minority students and the benefits of implementing culturally responsive leadership practices to support corrective action. Boneshefski and Runge suggested that if the data from the office disciplinary referrals suggested that the school has higher rates of disciplinary action the administration could implement cultural competence training for the faculty and staff, the behavioral expectations should be cultural relevant to the student body, and work with families to develop a behavioral plan that will be implemented within the school would support the student. Jimenez, Guzmán, and Maxwell (2014) argued that the fear and insecurities of students participating in a multicultural education can deter the success of the program and that the teachers have limited knowledge of the culture taught and create lower expectations of the students.

Obstacles implementing culturally responsive leadership practices in education. Administrators experience obstacles and challenges when implementing culturally responsive practices because of the lack of knowledge of cultures and resources to educate teachers. A qualitative study analyzing six principals conducted by Gardiner and Enomoto (2006) found that these administrators found ways to support multicultural learning although the preparation of teachers or themselves was lacking. Of the participants involved, two principals recalled that they had the foundation of multicultural education, but the four other principals did not experience any multicultural preparation in their past education. Each of the participants reported the obstacles to implementing multicultural education as being their preoccupation with the regular education students and lack of focus on diversity education. In two studies, principals reported that the

teachers had a deficit perspective of the students because of their low socioeconomic background (Battey & Frank, 2015; Nelson & Guerra, 2014). Furthermore, the obstacles included a shortage of teachers of color and limited administrators specializing in multicultural education. Gardiner and Enomoto found that male students from diverse cultures had difficulties with the interaction of female students and gang-related issues were a distraction from the daily educational practices. Stephens and Rose (2015) noted that obstacles of culturally responsive leadership practices include the difficulty of merging home cultures with normative learning models and are not a quick fix for the preparation of the leaders of a school.

Culturally responsive leadership practices of indigenous leaders. Indigenous leaders seek to implement culturally responsive practices in schools to support improve the outcome of native students (Ononuju, 2016). Santamaria and Santamaria (2015) completed a multiple case study about the culturally responsive leadership practices implemented from indigenous leaders from the United States and New Zealand. The study was conducted over a 3-year period and included counter narratives from the 16 U.S. and six New Zealand leaders. The study emphasized findings from three leaders' strategies to aid in the understanding of the type of culturally responsive leadership practices implemented in schools. The strategy suggested for parental communication was to provide a detailed plan for the members of the community to include them in the decision-making process of the school. The members of the community included are the individuals that had a relationship with from professional and personal experience. Another strategy was to invite national presenters to aid the teachers in the understanding

of the student culture, professional development meetings, and support culturally responsive pedagogy in the classroom. Similarly, a qualitative study conducted by Ononuju, found two effective strategies of an indigenous leader of an African American community: being accountable to the families and having legitimate authority within the community. The administrator understood the characteristics of the community such as culture, knowledge, and traditions that helped him gain the authority to guide the students to academic success.

Implementation of Distributed Leadership in Schools

Distributed leadership involves a collaboration between the teachers and administrators to execute the workload required to allow student educational success. Administrators once were considered parent-teacher buffers or managers are now responsible for the change within a school to support learning and organizational change (Malin & Hackman, 2017). Shared responsibility and interaction among the teachers and school leaders encourages the participation of the individuals in the workplace (Cansoy & Parlar, 2018). For example, Malin and Hackman conducted a qualitative case study in a secondary school of 1,800 students and found that as students transition from high school to college the workload for the administrator as substantial and to adequately support a college and career model in a high school, the responsibilities needed to be shared among teachers.

For distributed leadership to become effective within the school, leaders form a shared vision, create opportunities for leaders to emerge, employment of director and coaching positions to support the structure of a program, create a workplace culture to

enhance participation of the teachers and educational leaders, and experience the benefits and challenges associated with the implementation and change of a new program (Malin & Hackman 2017). A quantitative study conducted by Cansoy and Parlar (2018), that was designed to understand the relationship between distributed leadership, optimistic behavior among teachers, and trust in the administrators in Istanbul. The study found that administrator trust was a predictor of distributed leadership based on the perceptions of the teachers. Similarly, in a quantitative study conducted by Liu, Bellibas, and Printy, (2016) using the information from the Teaching and Learning International Survey 2013 data they found that school climate is related to distributed leadership including having discussions about difficulties in the workplace, mutual respect between colleagues, sharing of successes, and the relationship between students and teachers.

The components of distributed leadership. Spillane et al. (2008) did a quantitative study of two urban schools to understand the leaders plus aspect of distributed leadership. The researchers analyzed the data from the four operations that helped them understand which leaders emerged in a distributed leadership perspective in a school. The study found that after the series of operations that focused on emerging leaders only two-thirds of the language arts teachers and one-third of the mathematics teachers emerge as leaders.

Miškolci (2017) conducted a qualitative study at two public primary schools about the teacher perceptions about the practices of distributed leadership. The perceptions of the teachers suggested that the administrators distribute the tasks evenly amongst the leaders and to distributed tasks to the staff is a fair practice. The study

further suggested that teachers did not want the extra workload besides the teaching duties and other teachers felt that administrators are being paid to do the work and make the decisions.

Challenges of implementing distributed leadership in schools. Educational leaders who implement distributed leadership practices within a school can gain an emergence of leaders and balance the workload to support student achievement, but there are obstacles in the process. Mifsud (2017) conducted a case study that found that there are challenges when distributed leadership is implemented in a school organization. Mifsud further stated that the administrators described that the culture did not support distributed leadership because many times tasks are completed due to the administrator being a perfectionist and believes they can do it better and badly implemented distributed leadership can create isolation when there is not a shared vision among the leaders and communication can be affected making decisions be themselves. Sibanda (2017) noted that distributed leadership could be misused because of the exploitation of teachers by assigning insurmountable workloads, some principals do not want to relinquish their authority of a principalship to teachers and could undermine the duties or influence of an administrator. Similarly, in a qualitative study conducted by Spillane et al. (2015), a cohorts of novice principals were inclined to not support distributed leadership due to the becoming the hero and having a sense of responsibility to their school. They concluded that some of the cohort of novice principals had a positive outlook for distributed leadership because of the diversity and lessened volume of the workload it offered. Tahir et al. (2016) conducted a qualitative study suggesting that leaders have difficulties with

distributed leadership because of the lack of participation from teachers to become leaders, the teachers not being qualified to complete the duties of the school, or the teachers' lack the confidence to become a credible leader and preference to stay in the classroom. In contrast to the workload of an administrator and finding teachers to fill the necessary duties, some administrators find that the support of a teacher to become a leader is time-consuming. Torrance's (2013) findings agree with Tahir et al.'s that distributed leadership can be time-consuming for administrators because they have difficulties encouraging teachers to perform duties, modeling behaviors, and fulfilling management roles. Torrance further stated that the support of teachers using distributed leadership did not lessen the workload for administrators, but the role had changed to manage teachers.

Social challenges in distributed leadership. The role of educational leaders that have sole responsibility to dictate the success of a school has developed into a role that has socially changed and needs support from teachers within the organization. Van der Mescht and Tyala (2008) conducted a qualitative study on the perceptions of administrators and sharing the workload through school-based team management and found that the administrators of the 10 secondary schools had difficulties letting go of the responsibility and allowing another team member take charge of the task, trusting all of the team members, and becoming disappointed when a team member does not complete the assigned duties. The study further noted that team management is considered a social activity and the cohesion of the team can suffer when tasks are not given to the team members due to lack of confidence in their abilities. Van der Mescht and Tyala noted

that some of the team members might be compliant with the decisions made due to the fear of being criticized or the leaders lack the intelligence to challenge the decision. Distributed leadership can support change within an organization, but it is not necessarily the only driving force for change. Symons (2005) conducted a qualitative study of distributed leadership with 22 participants including teachers, administrators and community leaders and found distributed leadership supported the change for more diverse instructional strategies. According to Symons the data suggested that distributed leadership was not responsible for the change needed but the strength of the school climate and academics drove the change to support diverse instructional strategies. Researchers Ho and Ng (2017) found that within projects that involved distributed leadership conflicts and tensions can arise because individuals have more than one role and those roles can create distension due to the social norms or different outcomes of the leaders of the project.

Teacher leaders in distributed leadership. Teacher leaders are integral in distributed leadership because they are classroom teachers and have the knowledge that surpasses the classroom (Nappi, 2014). Hulpia, Devos, and Rosseel (2009) conducted a quantitative study that involved 2,198 participants with a 69% response rate and found that as distributed leadership is implemented properly, and the administrator was the influencer for the teacher. According to Klein et al. (2018) the participants of a qualitative study of distributed leadership were supported but were faced with restraints that prevented the capacity for distributed leadership. The restraints within the school Klein et al. studied included the leadership had an unclear vision of distributed leadership

for teachers and their role in assigned tasks. To combat the restraints, the teachers used the support of university mentors during professional development sessions which allowed the participants to gain confidence in becoming a leader. The professional development sessions were focused on an understanding of the interacting relationships within the teacher leadership role and place the right teacher for the appropriate leadership role.

Practices and Development of Culturally Responsive Pedagogy in Science Education

The qualitative research study conducted by Hulan (2015) took place in four diverse elementary schools with 25 teachers as participants to aid teachers in their thinking towards culturally responsive instructional practices. In addition to the 25 teachers, 12 teachers participated sporadically, and each educator taught at a low socioeconomic school. The participants were part of a book club that met every 2 weeks at their respective schools. Throughout 5 months there were 28 meetings for the data collection process. The design of the study was to aid teachers in their thinking towards culturally responsive instructional practices. The teachers answered two open-ended questions and completed double-journal entries to help with the readings and to support the knowledge of culturally responsive instructional practices.

According to Hulan (2015) in the beginning of the study the participants understood the importance of students experiencing diversity. The second part of the study found that during the professional development the teachers had a deeper understanding of their role in the culture of the students and their role in disseminating information regarding the culture of the students. While many professional development

sessions are designed to create a new understanding of culturally responsive teaching for teachers and professionals, some sessions have negative outcomes.

Alvare (2017) conducted a qualitative study about the professional development program called Sharing the Environment found the negative results of meetings between the Trinidadian and American culture involving five teachers and two school directors from each school district. The program was designed to aid in the implementation process of inquiry based culturally responsive pedagogy to a charter school in Chester, Pennsylvania and a prestigious private school in the Republic of Trinidad Tobago, West Indies. The Sharing the Environment program had three components for the professional development of the teachers. For example, there were a series of sessions about the implementation of the pedagogy for environmental science, the training of instructional technology, and helping plan field trips to destinations to local environmental sites.

According to Alvare (2017) the first negative impact was relying on a former student of one of the school directors in Trinidad. The former student made assumptions on the culture and religion and did not conduct the ethnographic research needed for proper support of the Trinidadian teachers. Other negative reactions were the basic instruction of technology, misunderstandings about the surveys and consent forms the Trinidadian teachers were asked to complete. The teachers found the basic instruction amusing and found the survey and consent forms offensive. The survey and consent forms requested information about race, ethnicity, and personal information. The teachers were offended because they were unclear of the purpose and use of the information. Based on the research of Alvare, the cultural exhibition of the Trinidadian

teachers that took place at the charter school in the United States was designed to embrace the culture but was not well received of the teachers because of the question and answer session of the exhibition. Alvare found that the issue was not with the intent of the professional development session, but the avenue had given misrepresented information regarding the culture.

A qualitative research study conducted by Underwood and Mensah (2018) found that all 11 science teachers involved in the study stated while they played a role in the improvement of the achievement gap between African-American and White students they failed to identify strategies for helping decrease the disparities between the two races. One of the participants was uncertain about introducing practices related to race because she had received a reprimand from her superior regarding the topic. Brown and Crippen's (2017) findings further might help the implementation of culturally responsive pedagogy in science education. In a program called Science Teachers Are Responsive To Students, with the four themes of community building, view of students, repositioning, and a culturally responsive toolbox, Brown and Crippen found that through observations, interviews, and artifacts that six teachers needed common areas of improvement to understand of the implementation process of culturally responsive pedagogy. Culturally responsive community building was not evident in the classrooms but in culturally responsive community building, the students are able to share with the other students the critical perspectives to demonstrate the expertise of the peers in a classroom. The view of students is based on the teachers' understanding of the macro level of the student in culturally responsive pedagogy. Repositioning in the classroom refers to the teacher

becoming the facilitator and include cooperative learning strategies. The culturally responsive toolbox refers to the science lessons that can relate to the students and provide instructional strategies for the teacher. Brown and Crippen observed that during the school year the participants shifted their thoughts from stereotypes to direct experiences and had a deeper understanding of the student's lives' outside of school. In contrast, Nilsson, Kong, and Hubert (2016) conducted a study about the difficulties teachers experience when implementing culturally responsive pedagogy. The experiences were about the workplace environment for example, lack of support from colleagues, lack of opportunities to incorporate new strategies, and heavy workloads.

Culturally relevant pedagogy in education. For students to have cultural success in the classroom, scholars have pointed out the three criteria for culturally relevant pedagogy: it should experience academic success, expand cultural competence, and understand the challenges within the current society (Frye & Vogt; 2010; Ladson-Billings, 2005; Mason, 2016).

Academic success. Academic success supports the students' choice of opportunity in the classroom and the teachers supported an environment to allow students to gain in the classroom (Ladson-Billings, 2005). Oliver and Oliver (2013) argued that the student must choose the pathway of academic success and understand that it is achievable and obtainable. There can be a disconnect between the home and school language, but the student can experience academic success by incorporating the home language into the classroom (Oliver & Oliver, 2013). Mason (2016) noted that students that achieve academic success can experience disconnection from identity development,

academic and social life and that many schools have policies that are implemented to help immigrant children but fail because schools do not identify patterns of cultural differences and racism that can cause the achievement gap.

Cultural competence. According to Ladson-Billings (1995a), culturally relevant teachers use the culture of the students to support a positive learning environment, parents are incorporated to affirm cultural knowledge. Oliver and Oliver (2013), argued that cultural competence must be sustained by the student and they should not be compelled to give up on their achievements. A qualitative case study conducted by Buck (2016) found that the 20 teachers interviewed implemented cultural competence and were able to successfully implement and embrace culturally relevant pedagogy based on their own cultural background. Many of the teachers were from the same area as the students, therefore able to connect with the students on a cultural level (Buck, 2016). The connection of culture in the classroom could allow students to succeed academically and socially in society. Broussard, Peltier-Glaze, and Smith, (2016), noted that teachers continuously reflect on their teaching practices because a lack of cultural competence can deter the learning process for students from diverse backgrounds. In fact, Casciola (2014) reported in a qualitative study of 32 pre-service teachers that the participants exposed to culturally responsive pedagogy became informed about cultural competence and changed lesson plans to accommodate the culture of the children. The pre-service teachers modified the teaching style of support the learning of the customs and beliefs of the students. Supporting educators to the benefits of culturally responsive pedagogy could support cultural competence in the classroom.

Critical consciousness. Ladson-Billings (1995a) described critical consciousness as not only being able to achieve academic success but to analyze and critique the social inequities that are part of society. According to Camangian (2015) creating inspiration to help other students to gain perspective and make collective goals to decrease the chance of oppressive suffering. Borrero, Ziauddin, and Ahn (2018) found that the teachers understand that a critically conscious environment must have the occasional discourse and requires planning and an open-minded mentality to be effective. The study found that teachers need space for collaboration due to demands from the administration and resources from mentors and models for effectiveness. Parsons (2017) noted ways to introduce the culturally responsive practices, such as, cultural knowledge and cultural awareness to bring understanding and appreciation of the culture of racially diverse students for faculty members who have difficulty with the capacity of cultural bias.

Student Experiences of Cultural Sensitivity in STEM Education

Black American students encounter institutional factors that adversely impact their persistence in science-related majors, and their talents are often wasted as they are discouraged from participating in STEM at predominantly white institutions (Green & Glasson, 2009). African American and Latino college students were found by McGee (2016) to rely on the coping strategy of stereotype management when facing racial bias in higher education STEM courses. To further support the progress of ethnic minority students, McGee tracked 61 students' careers and experiences and interviewed 38 of them throughout 4 years. Stereotype management is a strategy that allows the student to

become focused on the rigorous coursework as a STEM major but while being aware that they are undervalued and constantly have to justify their intellectual ability to peers and professors because of their race or gender. Examples of stereotype management are becoming hypervigilant, excelling in coursework, understanding the material better than their peers, and frontin'. Frontin' was described as changing their identity to prove themselves in a STEM classroom. Among the students interviewed and tracked, only one Asian and two Latino students reported that they did not experience these types of situations. Daily and Eugene (2013) noted that the students in STEM programs that incorporate self-awareness, empathy, computational skills were able to reflect on the emotions of others and their own. Strayhorn (2015) conducted a mixed methods study and found the Black males had self-efficacy in their ability to perform academic duties such as maintaining a 3.0 grade point average or writing term papers as a STEM college student ($M = 6.29, SD = 0.84$). During the qualitative portion of the study, the participants used the words *confidence* and *endurance* when describing the forces that motivate them to continue academic success throughout hardships in college.

Experiences of ethnic minority students in STEM education. In some post-secondary institutions strategic plans have been set to support the diversity of STEM programs, but there are challenges associated with the implementation process. A qualitative research study conducted by Lancaster and Yonghong (2017) found that there are obstacles that prevent ethnic minority students from completing their STEM degrees. Within the study, 25 African American students that included 21 males and 4 females were interviewed and participated in focus groups to find the reasoning for not

completing a degree. For example, students reflected on the having ambivalent feelings towards the teachers and suggested that the teachers were not passionate about teaching because they were scientists and did not have the experience to be considered a good teacher. The participants had a formal but weak relationship with the faculty. There was also reported a disconnect between the courses taken during the freshman and sophomore years because they were repetitious of high school, but during their later years, the coursework became difficult. In addition to the large class sizes and the course not being available, students became frustrated with academic advising. Students reported that the advisors had high student advisor ratios and there was not an opportunity to have a face-to-face meeting to discuss their academic progress.

In addition to the negative aspects of social interaction within a STEM educational setting. Charleston, Charleston, and Jackson (2014) found that positive support can be in the form of positive familial cultivation, peer and community modeling, and multifaceted mentorships from advanced graduate students, parents, and professors. Researchers Lancaster and Yonghong (2017) found the many challenges, the positive aspect of the support offered were from students' organizations, peer supports, and mentoring. These positive avenues allowed the students to form a support system and that offered the most assistance during their education.

Summary and Conclusions

The major themes explored in Chapter 2, demonstrated the need for culturally responsive leadership practices to be incorporated into a school that has a STEM initiative. In Chapter 2, I discussed the search terms and databases I used to locate

journal articles for the literature review. The conceptual framework that I presented in the study is distributed leadership. I analyzed journal articles on culturally responsive leadership practices, diversity in STEM, STEM education, obstacles ethnic minorities in STEM education and distributed leadership. Within each section, I found culturally responsive leadership practices, experiences of a STEM student within a diverse educational setting, professional development for teachers that incorporate culturally responsive pedagogy and the support ethnic minority students receive throughout their education in a STEM school.

From the current literature, it is known that ethnic minority students are limited in numbers in STEM fields, in part due to negative competitive environments in the classroom, limited opportunities for STEM education, and socioeconomic inequality (Arcidiacono, Aucejo, & Hotz, 2016; Hurtado, Newman, Tran, & Chang, 2010; Wang, 2013). However, the implementation of culturally responsive leadership practices can improve the outcomes of society by creating a critical consciousness among the students to build a knowledge of different cultures and student backgrounds (Johnson, 2014), support the relationship between the parent and student (Santamaria, 2009) and the values and identity of the students to be empowered within the classroom (Milner, 2016). Guerrero, Fenwick, Yinfei, and Kong (2017) found that the leadership and the set of expectations of the supervisor can affect the implementation of culturally responsive practices, the climate of the organization and the knowledge of racial and ethnic minority communities. I found that administrators who use distributed leadership can create teacher leaders, the collaboration of team members, and support the interaction of school

leaders within a school to balance the workload of the increased pressure for school performance. Few studies address the influence of the practices of administrators to support the diversity of ethnic minority students within a STEM school and how these practices can be incorporated using distributed leadership among the faculty. In my literature review, I found the need to understand how culturally responsive leadership practices could contribute to the support of diversity within a STEM school, how administrators incorporate these practices using distributed leadership.

I will describe the methodical design for this study is described in Chapter 3.

Chapter 3: Research Method

The purpose of this case study was to explore the perceptions of administrators and teacher leaders regarding the types of culturally responsive leadership practices using distributed leadership that support racially diverse students enrolled in a mid-Atlantic STEM school. Observations of the interactions and relationships were made between the formal and informal leaders and how distributed leadership contributed to the types of culturally responsive leadership practices implemented within a diverse group of students within a STEM school.

In this chapter, I introduce the role of the researcher, central concepts and the research tradition, and the methodology. This chapter includes the rationale for the participant selection and recruitment as well as a description of the procedure and instrumentation for the data collection methods and the data analysis plan. In Chapter 3, there is also an exploration of the trustworthiness of the study that includes attention to credibility, validity, bias, dependability, and code worthiness.

Research Design and Rationale

In this section, I restate the research questions and provide justification for the use of a qualitative research approach for this case study as opposed to the quantitative research approach. Yin (2018) noted that the use of case study evidence (e.g., documentation, direct interviews, physical artifacts, archival records, and participant observation) substantially increases the quality of the research study.

Research Questions

The focus of this study was to understand the culturally responsive leadership practices that are implemented in conjunction with the procedures and methods for using distributed leadership among the administration and teacher leaders for students from a diverse population enrolled in a STEM school. The following research questions guided this study:

RQ1: What culturally responsive leadership and distributed leadership practices are used by administration and teacher leaders to increase the diversity of students choosing STEM classes in a racially diverse STEM school?

RQ2: What are the challenges and opportunities in implementing distributed leadership and culturally responsive leadership practices to encourage more students of color to participate in courses in a STEM initiative curriculum?

Role of the Researcher

My role as the researcher was to be as an observer and be responsible for ethically conducting this study. I was also responsible for being a good listener, asking good questions, staying adaptive, and having a firm grip of the topic in the research study (see Yin, 2018). I did not have any professional or personal relationships with the participants in this study. The study site school did not employ me, and I did not have any children or relatives attending the school. I did not have any authority over the teachers, staff, or leadership at the school. I am a STEM teacher and did not inflict bias into the study. As the information was collected, my interpretation was adequate and I avoided contradictions in the data collection (see Yin, 2018).

I controlled for bias in the study by concentrating on the purpose of the study and understood the judgments that could create deviation from accurate data collection. Ethical issues, such as completing the study at the location I was employed at, and conflicts of interest did not occur due to the study taking place in a different state from where I reside and work. Another conflict of interest was not a problem because the school participating in the research study had a different type of STEM program than my school of employment. I addressed these possible issues by striving for the highest ethical standards, such as avoiding plagiarizing information and deception, taking responsibility for scholarship, and honesty, strong professional competence, and having responsibility for my own work (Yin, 2018).

Methodology

In this section, I describe the reasoning for the site selection; participant selection; and instrumentation used for the interviews, observations, and school documents for this study. I employed a case study design in this qualitative study. The case study involves real-world context while investigating a contemporary phenomenon and relies on multiple sources of data through data collection and analysis (Yin, 2018). Among the other types of qualitative approaches are grounded theory or a narrative design. A grounded theory design is based on the meaningful events for people and the meanings of the events must be shared (Backman & Kyngäs, 1999). The grounded theory design is ideal if a theory is not available for the explanation of a process and the research questions focus on how the individuals experience the process in the research problem (Lewis, 2015). In contrast from the grounded theory and case study approaches, a

narrative design has a focus on studying one or two individuals and the data were based on their story and experiences (Lewis, 2015). According to Lewis (2015), a narrative design involves individuals who have a story to tell and the researcher spends much of the time understanding the experiences of the person. The case study approach was appropriate for my study because I was in a bounded setting and collected data from multiple sources (i.e., interviews, observations, and school documents).

Site Selection

I assigned the pseudonym of Katherine Johnson STEM Academy (KJSA) to the study site. I used pseudonyms to protect the identities of the school and participants of the study. KJSA is one school within a complex that supports a STEM curriculum that offers elective courses based on thematic areas of focus, including engineering, technology, forensics, and environmental science. KJSA has a diverse student body that educates approximately 600 students in Grades 9–12. According to KJSA's website, the Hispanic population is about 50% of the student body, while 20% is African American and 20% is Asian and 10% White. I chose KJSA as the data collection site because of the culturally diverse student population and the use of distributed leadership to support the decision-making for the students enrolled in STEM courses.

Participant Selection

The participants at KJSA included two administrators (i.e., the principal and assistant principal), the curriculum facilitator, and six STEM teachers. To be included in the study, the participants had to have been employed at KJSA for at least 1 year of the school adopting the STEM curriculum. STEM programs do not require teachers to be

certified unless the STEM curriculum requires training to teach the course. The administration and I made a list of the STEM teachers who instructed students in Grades 9–12 and participated in the decision-making of distributed leadership of the school. I discussed the inclusion criteria with the principal of the school to ensure adequate and appropriate participant selection.

I e-mailed the eligible, possible participants an invitation that also discussed the purpose of the study and how their contribution can benefit the community. I invited two teachers from the engineering department, two teachers from the computer programming department, and two teachers from the biomedical engineering department. The rationale for inviting participants from these departments was to understand the various aspects of culturally responsive leadership practices in the different departments because the needs of the students could vary within the course. The goal for the selection of the participants was for the data collection process to offer through answers to the research questions to gain an understanding of the multiple, complex perspectives, and the sampling size was determined by selecting participants who reflected the entire school in the study (see Ravitch & Carl, 2016; Yin, 2018). I used Starbucks gift cards as an incentive.

The procedures for recruitment of the participants began with receiving recommendations from the principal on the qualified teachers as well as his permission to conduct the interviews. In the invitation letter e-mailed to possible participants, I included the following:

- A summary of the purpose of the research study,
- my name as the researcher,

- the role of the researcher,
- the criteria involved in the study,
- the advantages and disadvantages of participating in the study,
- the confidentiality and consent forms as well as a description of the confidentiality and consent forms to ensure the participant understood that the information they provided would be protected,
- contact information for dissertation chair and Institutional Review Board (IRB) for any additional questions,
- my contact information to answer any additional questions, and
- an invitation for participation.

After the participants reviewed the documents and completed the consent form, I coordinated a time and place to conduct the interview with them. Once the consent forms were signed, I reviewed the school documents associated with the study, such as lesson plans, faculty meetings, parent newsletters, and classroom observations.

In a qualitative study, data saturation is achieved when enough data has been collected that no new codes or themes are emerging (Fusch & Ness, 2015). The relationship between saturation and sample size is the saturation point, which is the guiding factor for the sample size in a qualitative study; studies that are smaller in size and have modest claims could reach the saturation of the information quickly (Mason, 2010). For the purposes of this study, I chose 10 participants to create credibility.

Instrumentation

The data collection instruments used in the research study included an interview protocol (see Appendices A and B) as well as observation coding sheet and school documents coding sheet. The aim of the qualitative interviews was to have an understanding of the participants in a school setting and the situations and events that have taken place there (see Patton, 2015). I developed the interview protocols (see Appendices A and B) from the research questions as well as the conceptual framework and literature review. Observations can be used as instruments to record the activities of the participants and enhance the validity of the data because the participants are in a natural setting (Ravitch & Carl, 2016). In this study, the observations were centered around the culturally responsive leadership practices incorporated with distributed leadership in a STEM school, and I coded them by taking copious notes by hand that were intertwined with codes from the interview. The school documents used as an instrument were the lesson plans of the teachers and any written information the leaders had and were willing to share that documented their decision-making practices regarding the students. The school documents I reviewed provided evidence of the school operations and documentation of the methods used to support a diverse student population. They were coded by documentation analysis using field notes.

Procedures for Recruitment

The recruitment process started with choosing an appropriate data collection site. Once KJSA was chosen and I received approval from the district and administration, I began the recruitment and selection of the participants of the study. I participated in an

existing meeting with all of the administrators and teacher leaders of KJSA to discuss the purpose of the study and the benefits of supporting a diverse group of students. Before my arrival to the campus, I sent out flyers and follow-up e-mails to the possible participants for participation in the study. After the participants volunteered their time for the study, I sent them an e-mail with the consent form and several of the interview questions. Once the consent forms were received, I scheduled the interviews with participants. Each participant received e-mail confirmation of the meeting times and my availability on campus.

Data Collection

Case study evidence can come in the forms of interviews, observations, and artifacts such as school documents that allow different data collection procedures to collect data based on actual human events (Yin, 2018). To strengthen the validity of the study I had data triangulation among the multiple sources of data of the same phenomenon (Yin, 2018). The interviews, observation, and school documents were collected and analyzed together, and each may have distinct properties which offered several perspectives.

The interviews, observations, and school documents were aligned to the research questions for the purposes of accurate data collection. The data collection events were over 5 days at the KJSA. The interviews were collected by me as the primary researcher. I interviewed the administration and teacher leaders with one interview with a possible follow up with the participants once they reviewed the transcript for accuracy of the information collected. The data collection events were over 5 days at the STEM

academy. I did the observations in the classrooms and faculty meetings on the designated meeting days. The interviews were recorded by IRecord. The school documents included the lesson plans and analysis of the school website, mission, and vision statements.

I effectively collected data that aligned with the research questions and the analysis from the interviews, observations, and school documents collected from the data collection. The research question connected to the interview questions by specifically describing the types of culturally responsive leadership practices that supported diversity in a STEM school. The second research question aligned to the interview questions by exploring the difficulties, challenges, and opportunities of culturally responsive leadership practices and distributed leadership when implementing a STEM curriculum. The classroom observations connected to the research questions by noting the implementation of the culturally responsive leadership practices and effects of distributed leadership of the administration within the classroom. The school documents such as lesson plans and parent letters connected with the research questions by noting, in artifacts, evidence of the difficulties, challenges, and opportunities of the culturally responsive leadership practices implemented within the STEM school.

The follow up plan was if too few participants have been recruited, have clear communication about the research study while I am on the campus. I had adequate communication with the participants and administration to collect an adequate number of interviews, observations, and review of school documents.

To further support the credibility, follow up procedures, and exiting of the study I conducted transcript validation by checking with the participants and asking them to verify the transcripts of the interviews or asking feedback on the aspects of the research process (Ravitch & Carl, 2016).

The manner that I treated discrepant cases is to thoroughly complete the data analysis process in an organized procedure. The participant was skilled in the area of the research study to offer credible information for the study. I selected a school for data collection that I understood includes administrators and teacher leaders who have the expertise to answer the questions in the interview.

Data Analysis Plan

Based on the research questions I discovered patterns, themes, and trends in the data collection process that was derived from the interviews, and observations, school documents gathered in data collection. The projected plan I created involves discovering the patterns and trends gathered based on the interviews, observations, and school documents that aligned with the research questions. I hand coded the information collected during the data collection time. During the coding process I used preliminary techniques such as highlighting and underlining the text of phrases and quotes that are relevant to the study (Saldana, 2013). Afterward, I transitioned into descriptive coding for the purposes of the qualitative research study. Descriptive coding involves repetitive key terms that are located in the transcript and repeated throughout the text. The key terms are extracted from the transcripts and assembled together to create a narrative of the setting for analysis of the data (Saldana, 2013).

Coding can produce a framework that can describe and classify the information that has been collected during the interviews and observations (Patton, 2015). Ravitch and Carl (2016) noted that coding the information from the interviews can involve words or phrases that organize the data and allows the information to be manageable for themes in the data. As I coded the information, I created a code set that was focused on the research questions and descriptive concepts that resembled the text (Ravitch & Carl, 2016). I looked for the following concepts when coding the data:

- Agreement of information from the participants,
- Disagreements among the participants,
- Repetition of the data,
- Emotional language used by the participants (p. 251).

The manner to treat discrepant cases was to align the interview questions, observations, and school documented used for the collection of data to the research questions and literature review.

Trustworthiness

Establishing credibility is an important part of the study because it supports the connection between the research question, practical application, and the techniques involved with the data collection (Twining, Heller, Nussbaum, & Tsai, 2017). The credibility in the research study was established by reducing bias on the part of the researcher and participants that volunteered for the data collection process. The bias in the research study was reduced by the open-ended interview questions that were focused on the problem, purpose, and the research questions of the study. To further support the

credibility of the study, I sent transcripts to participants. For the purposes of the study, transcript checks ensured the accurate depiction of the research data. Triangulation further supported the credibility of the research study by using multiple sources of evidence such as observations, field notes, open-ended questions for the interviews, and review of organizational documents (Yin, 2018).

Transferability is a critical aspect of qualitative study because it allowed the reader to visualize the components of the study into different contexts or settings (Ravitch & Carl, 2016). The strategies that supported transferability in the study were to have detailed descriptions of the data and thick description of the context (Ravitch & Carl, 2016). To support transferability in my study I provided a thick description that entailed a detailed description of the circumstances and contexts of the information to help the reader to have full understanding of the behaviors of the participants in the study (Curtin & Fossey, 2007). A thick description allowed the qualitative study to be understood in the entire context in which included data gathering, raw data generated, or an analysis of the data (Curtin & Fossey, 2007). In the context of the study, a detailed description of the participants was provided by me to allow the reader to make similarities or comparisons with other settings, groups, or individuals to include in research findings or their own personal experiences.

Dependability was necessary to support the credibility of the study because it offered the stability and consistency of the data over a time period (Ravitch & Carl, 2016). I allowed the data collected to be dependable and correlated to the research question (Ravitch & Carl, 2016). Strategies of dependability were triangulation,

sequencing of the data, and a rationale for why the researcher chose the appropriate data collection plan (Ravitch & Carl, 2016)

Confirmability supported the credibility of the study because the data provided had limited bias. Confirmability addressed the concept of bias and the exploration of possible prejudices because bias can become problematic and scrutinized in a study (Ravitch & Carl, 2016). I provided support of confirmability that included triangulation of the methods and reflexivity which allowed the data to become inquiry-based, have interactive meaning, and aware of the dynamics within the study (Ravitch & Carl, 2016).

Ethical Procedures

Patton's (2015) list of principles of ethical issues guided me in the protection of the participants and the data collection. The following includes steps that I performed during the research study:

- Explain the purpose of the study that is accurate and understandable,
- Be an honest and transparent researcher,
- Honor the time of the participants,
- Protection of the confidentiality of the participants,
- Understand the procedures for ethical and legal principles of confidentiality,
- Following the standards of my discipline,
- Have a plan for handling ethical issues,
- Know ethical standards,
- Report the ethical issues faced when completing the research, and
- Follow the ethical code of conduct (pp. 496-497).

The study followed the procedure identified by the Walden IRB to protect the integrity of the Walden University and the participants of the study. I obtained approval for the research study from by the IRB (09-27-19-0528419) and abided by the protocols set forth before the collection of data. I obtained permission from Katherine Johnson STEM Academy a pseudonym for protection of the educational institution to be able to perform and conduct the study according to the guidelines established by the district. To protect the identity and confidentiality of the participants in the study, I used pseudonyms for the names of the participants and the school.

The consent and confidentiality form aided in the integrity of the study to protect Walden University and the participants in the study. Patton (2015) noted the key measures that are needed to be addressed with the participants of the study. These measures include:

- Protecting the identify and information about the participants of the study and knowing the difference between confidentiality and anonymity for the purposes of the data.
- Validate the accuracy of the data and be prepared for the ethical issues that could occur. The participants information will be recorded and protected by an application called IRecord.
- The written data collected will remain protected in my home office and remain intact for approximately 5 years.

All of the information collected was confidential, and transcripts shared with my committee members were de-identified to maintain the integrity of the data. The

participants received a copy of the transcribed interview to ensure the agreements between the researcher and participants was met.

Summary

Chapter 3 began with the restatement of the purpose which is to explore the culturally responsive leadership practices incorporated with distributed leadership within a school that supports a STEM initiative. The research questions and an explanation of my role as the researcher were provided. The methodology discussed the purpose of choosing a case study versus other types of qualitative research studies such as grounded theory and narrative were described. The participant selection, procedures for recruitment, and instrumentation were explored to understand how the participants will be selected and the types of artifacts used to collect data. An explanation of the data collection included the proper use of the interviews, observations, and school documents that used to obtain the data for the research study. The data analysis section explored how the data will be analyzed once the data is collected. In the latter portion of the Chapter 3, I described how the trustworthiness will be maintained throughout the study such as credibility, transferability, dependability, and confirmability. The last part of the chapter included the ethical procedures that will protect the university, participants, and the data collected.

I will describe the summary of the collected data for this study in Chapter 4.

Chapter 4: Results

Introduction

The purpose of this case study was to explore the perceptions of administrators and teacher leaders about the culturally responsive leadership and distributed leadership practices of a STEM leadership team at KJSA with a diverse population of students located in the mid-Atlantic region of the United States. I used a single case study of one school to explore the perceptions of the administrators and teacher leaders and address the two research questions. Chapter 4 includes a restatement of the research questions, a description of the setting and demographics, an overview of the data collection and data analysis, and the evidence of the trustworthiness of the research study.

Research Questions

1. What culturally responsive leadership and distributed leadership practices are used by administration and teacher leaders to empower parents and support the diversity of students choosing STEM classes in a racially diverse STEM school?
2. What are the challenges in implementing distributed leadership and culturally responsive leadership practices to encourage more students of color to participate in courses in a STEM initiative curriculum?

Setting

I conducted this qualitative case study at a STEM school in the mid-Atlantic region of the United States that educates approximately 600 students. The pseudonym given to the STEM school is KJSA. I chose KJSA as a site because of the population of culturally diverse students in Grades 9–12 and its offering of STEM courses, such as

Forensic Biology, Engineering, and Computer Science. KJSA has a diverse population and supports distributed leadership and culturally responsive leadership practices utilizing resources from the teachers and the community to sustain support for a diverse student population. I did not have any professional relationships to employees of KJSA, and it was located in a state that I did not work or reside in. I only knew one teacher at the setting before exploring the possibility of collecting data there. The lack of professional ties may have allowed the participants of the study to express themselves with limited bias. During the 4 days I spent at the data collection site, I was met with a kind administration and teacher leaders. They were accepting of my presence in the classroom and offered any help they could to make my stay enjoyable.

Demographics

KJSA is a diverse STEM school, educating students in Grades 9–12. According to the school's website, the culturally diverse population at KJSA includes approximately 50% Hispanic, 20% African American, 20% Asian, and 10% White students. The home languages spoken by students are approximately 45% English, 30% Spanish, 20% South Asian, 5% Arabic, and 5% other languages. During the 2017–2018 school year, the Hispanic population decreased by approximately 1%, and the African American population decreased by approximately 3%. While those two ethnic groups decreased, the South Asian and Asian populations increased by approximately the same amount.

The KJSA administrative and teacher leader interviewees in this case study included a school principal and six teacher leaders who have been employed by the school for at least 12 to 28 years. The six teachers included one engineering instructor

who led a robotics team, one forensic biology instructor, one technology instructor, one algebra instructor, one behavioral management/biology instructor, and one chemistry instructor. These teachers were informal teacher leaders within the school, as described by the principal, because the district does not yet have a formal title for these roles. I have used pseudonyms for the school and participants of the study to ensure their confidentiality.

Data Collection

Recruitment

To gain access to the study site, I asked a classmate to request informal permission from the principal of KJSA to begin data collection. Before I could collect any data, I had to receive official IRB approval from both the school district and Walden University. The contact at the school district was the director of accountability and assessment. To gain approval from Walden University IRB, I requested a conditional approval from the director of accountability and assessment of KJSA's school district. Upon receiving the conditional approval, I was able to move forward with the IRB approval process for Walden University. Official IRB approval from the school district was sent after obtaining IRB approval from Walden University. After gaining approval from both Walden University and the school district IRB, I sent an e-mail to the principal with the IRB approval letter of the school district, which stated that I could begin the data collection process.

Four weeks before my site visit, the principal and I were able to agree on 4 days in 1 week during which I could complete the data collection process, so I began arranging

interviews and classroom observations. On the first day of arrival, the principal recommended teacher leaders who met the eligibility to participate in the study, and I posted the recruitment flyer outside of the main office door of KJSA. I began to send e-mails to teacher leaders provided to me by the principal along with the consent form and invitation to participate in the study. The participants confirmed the location and times for the interviews and submitted lesson plans for the classes that could be observed. I received the school documents for review from the administration and posted flyers throughout the school during a self-guided tour of the facilities. The six teacher participants were given the following pseudonyms: Sam, Alice, Janice, Debbie, Tom, and Stella; the principal received the pseudonym of Walter.

Sources of Data

I visited the school for 4 days in a row for an average of 8 hours a day. Data collection included interviews with seven participants (i.e., the principal and six teachers), classroom observations, field notes, and school documents (including lesson plans from the STEM teacher leader and documents distributed to the parents and community). The interviews took place in various areas of the school, such as classrooms, the principal's office, and a workroom. The interview location was determined by each participant to allow flexibility within their daily schedule. The interviews were conducted over 4 days and lasted approximately 30 to 50 minutes in length. The lesson plans were sent to me by e-mail from the six STEM teacher leaders I interviewed. The six classroom observations lasted 41 minutes each (i.e., one class

period per teacher leader). The school documents were flyers written in English and Spanish and were designed to accommodate the language differences of the community.

The original plan for the data collection was to interview one additional school leader, but the vice principal was being acclimated to a new position and lacked the experience for the planned interview. The data from the participants, observations, and documents were sufficient to achieve data saturation because of the multiple perspectives within the STEM courses and curriculum offered at KJSA.

Interviews

At the beginning of each interview, I collected the completed consent form from the participant. I explained the procedure of the interview to reduce the risk factors associated with participation in the study. A smartphone app was used to record the interviews, and extra copies of the consent forms and interview questions were brought in case a participant needed either. The administration and teacher leaders seemed knowledgeable about the logistics and background of the school. During the interviews, each participant shared their experiences and perceptions of culturally responsive leadership practices and distributed leadership within KJSA. After the interview, I asked each participant if they had any other thoughts or questions. The app, Voice Memo, was used for the initial recording of the interviews, and an app called Transcribe was used to transcribe the participants' interview responses.

Documents

I collected documents that were displayed throughout KJSA. Before the school, I completed a search of the demographics of KJSA to better understand the types of

culturally diverse students. The types of documents I received were flyers the school had distributed to the parents to bring awareness of the full-service community health center, the department of health, and the technologies offered to update them on the grades and attendance of their child. These documents were written in English and Spanish to accommodate some of the languages spoken by the diverse population. The school did not translate the flyers into South Asian, Arabic, or other languages reflecting a smaller number of students. The principal shared the master schedule and the parent portal flyer with me as well.

Observations

I observed one 41-minute class of each of the six teacher participants. I also observed the following three meetings held at the school: Mindful Monday, Culture and Climate, and the School Improvement Data meeting. Mindful Monday consisted of activities to be thankful for within life, such as the food eaten daily, and the teachers were given time to meditate on thankfulness of their lives. The culture and climate meeting consisted of teachers supporting the positive culture within the school, such as the attendance board to promote student attendance. The school improvement data meeting reviewed the statistics from the teacher walkthroughs and ways to be progressive within the school to deliver better instruction.

Evidence of Trustworthiness

I upheld the credibility of the study during the data collection process by limiting the amount of bias through asking the participants with open-ended questions that focused on the problem and research questions. After the data collection process had

concluded, participants were sent transcripts of their interview responses to ensure the accuracy of the data collected. Triangulation of the classroom observations, lesson plans, school documents, and interview questions was used to support an accurate depiction of the data collected during the study.

The transferability of the study was supported by providing the participants with a thick description of the circumstances and context of the research study. By providing a thick description, the reader can visualize comparison of the information with different settings or groups. To further support the transferability of the study, I allowed participants to recount their personal experiences during the data collection process.

I supported the dependability of the study by being consistent with procedures and the data collection process. I provided a transcript promptly to the participants to support the accuracy of the data. Dependability was further supported by the triangulation of the data.

Confirmability supported the trustworthiness of this study by limiting the bias that could occur during the data collection process. I limited bias during data collection by asking open-ended questions in the interviews and understanding the dynamics within the study. I further supported the confirmability by triangulating the data to support the claims found within it.

Results

While I intended to answer the two original research questions with the findings of the case study, the results are best characterized by the original first question and a slightly different second question. The first research question was: What culturally

responsive leadership and distributed leadership practices are used by administration and teacher leaders to empower parents and support the diversity of students choosing STEM classes in a racially diverse STEM school? In addressing this question, I captured what I learned about the *opportunities* to implement culturally responsive leadership and distributed leadership practices to support the diversity of students choosing STEM classes in this racially diverse school. The remainder of the key findings are addressed best by focusing on only what are the *challenges* rather than the focus of the previous second question on both challenges and opportunities.

In this section, I present the findings in relation to the two research questions, starting in each case with the theme that was most prominent. For Research Question 1, the themes were as follows:

- Collaboration among faculty,
 - Striving for positive interactions with students,
 - Community outreach to parents, and
 - Technology to support communications to diverse parents.
- The themes for Research Question 2 were as follows: Language differences,
- Cultural issues within the diverse student body, and
 - Student motivation, preparation, and absenteeism.

Culturally Responsive Leadership and Distributed Leadership Practices

The most common theme to emerge in the data was the importance of collaboration among faculty and the leadership's open-door policy regarding innovative ideas from faculty. While there was not a formal distributed leadership model, the

teachers felt they were encouraged as curricular and cultural leaders and the principal Walter frequently spoke to his aim to empower faculty so they could empower students and parents. The other themes were striving for positive interactions with students, community outreach to parents, and technology to support communications to diverse parents.

Collaboration among faculty. The most common theme of the data was collaboration among the faculty members. For example, Debbie, Janice, Walter, and Tom (pseudonyms) explained their positive experiences working with their colleagues using distributed leadership. Walter, the administrator, “It’s really linking these after-school and extracurricular activities to give the kids a hook.” Walter further emphasized,

Most of the things that we do are from our teachers, and what I do is make sure that it's all on the up-and-up and that it's going to benefit our students, and I give them the green light 90% of the time probably more. What's good about being in a good culture is that they're not afraid to come and ask me to do that.

Debbie shared her experience with distributed leadership,

We often discuss how to handle different students and how to reach them. This one's falling off, and that one's not doing what they're supposed to do. So, yeah, we offer to discuss.” You know, what do I do? How do I get this kid, you know, do what you're supposed to do?”

Janice, a fellow STEM teacher leader, also shared her experiences with distributed leadership and that she is able to receive lessons and activities to further motivate

students. “By collaborating, we help each other to find you know things and lessons and activities that will help motivate the students that's like classroom collaboration.”

Tom, the engineering teacher leader, noted,

It's never been a negative experience, or you know a challenge to work with those people that they want to be there. And so, I was feeling it's a positive experience. I mean other teachers that I work with in STEM. I'm very spoiled because they are always quick to collaborate and share ideas, and I can't really say that I've ever had an issue with my colleagues in that way.

One reason this collaboration may be possible is Walter's open-door practice. The teachers felt it is an example of the collaborative culture of the school that honors teachers as informal teacher leaders in a distributed leadership style. Walter explained:

A lot of teachers come to me and say, “look, I found this can we do this,” and I usually say “yes” unless it's some crazy thing. So, a lot of teachers bring things to me like Alice, who's does the technology at our school. She found this Girl's code program, and they're going to a Girl Summit down at another school, and they're going to participate in that program. I very rarely say “no” when it's something totally reasonable; out of 20 things that teachers come to me with, I might have to say, “I don't know that we could do that,” but most of the time, it's just “you run with it. Let's do it. Let's make it happen and make it work.”

Tom confirmed the open-door relationship with the administrator, Walter, “He's been very creative like if something is brand-new, he gets us equipped with supplies, so I don't find it to be a challenge because I feel like if I need it, I go get it.”

However, 1 of the 7 teachers described the lack of collaborating with teachers regarding the students. Alice describes distributed leadership experiences as non-existent.

We don't have very good collaboration. It doesn't mean we aren't friends. We sometimes don't talk to each other, but some schools build in the vocabulary that you learn in English matches the science words and in math. They will go with the computer science whenever everybody here is just trying to make it through the day. There's not a lot of structured collaboration.

Tom felt the limits of the school budget interfered with him being a teacher leader in the informal distributed leadership format. "If I really had to point to a challenge and I think anybody could say it is the budget, you know, I mean some of the things I'd like to have but...we can't afford it.

Findings from the master schedule and school leadership meetings verified the informal roles of the teacher leaders using distributed leadership. The master schedule confirmed the informal teacher leader roles by listing the subject and other roles the teacher leaders have, such as the coach of a robotics team or club. The school leadership meetings confirmed the informal roles as teacher leaders by the attendance of various teachers that taught a variety of subjects.

Striving for positive interactions among diverse students. All of the participants noted that they have interactions with the diverse student population at KJSA. Walter, the administrator, noted that "The interactions could be positive or negative".

Teachers will call me into the classroom because of an issue that they can't manage, then that's clear. That's part of the whole disciplinary issues and things like that, but I go in into classrooms; I just stop in or do a walk-through. I don't want to create a distraction. Yeah, so, but then there's other times when you know, I have to talk to the teacher. I usually involve students, and I'd make little jokes.

Debbie noted that the interactions among the diverse student population are “usually positive”.

She also explained that types of conversations that occur:

In Advanced Placement Biology, we talk about ethics, we talk about research, and I'll often ask them about their cultures how they feel about different things. I mean some sometimes they'll say, “you know, we don't do it this way. We do it that way. My grandma says to do this”, or they're always positive, there were usually positive interactions. I encourage them to bring that into the classroom.

Alice compared her interactions with her previous teaching positions 2 years prior to her current teaching position at KJSA.

Before coming to KJSA I taught in a smaller school, and race was everything, really everything. Wow. I had kids tell me, “Well, you put them over there, and you put me over here because you're prejudiced against me”. And I said, “what do you mean prejudice? I don't even know what you're talking about. You're both Hispanic.” Wow, and he said well, “I'm Dominican, and He's Puerto Rican” or something wrong. I have always been proud of KJSA and the people in our city, and there are a lot of preconceived notions, but I have always been proud.

Stella gave an account of the interactions in which she tries to show the students she is a caring teacher.

I think if they know you care about them and you get to know them on a personal level, even joking around with them... They really connect, and with that personal touch, I think in class, and I've seen that throughout the years”.

Janice focused on interactions regarding enforcing rules where she tries

to keep everything positive. I'm going to enforce school rules, which I know they're not going to be happy about that. But in the long run, I think they do appreciate it ... I always heard that the teachers that are the most effective teachers are the ones that are strict but fair.... There are certain rules in place, and the biggest thing that I've always done is I care about my students. It shows, and they know that, so I think that comes out in the being strict and then being fair, you know because I truly care about them. I want them to succeed. So if they're on their phone or not listening to me, they're not learning the material they're not going to be successful because they're not going to do well, so I do try to be very fair. I think the biggest thing they do see that you care if they know that you like them, and you know you want them to be successful.

Similarly, Tom agreed that his interactions with the diverse student population is “on the majority positive”. He further elaborated on the challenging experiences of the students that can affect his interactions within the STEM classroom.

You know, I think that there is a percentage of kids like any group of teenagers that are dealing with boyfriend-girlfriend things. Sometimes they come in with

that kind of minor baggage. ... and then there are a percentage of them who you are dealing with things that you know, some people don't even see in a lifetime, and sometimes kids have experienced some heartache and some tragedy, but in terms of my interaction with them, you know most of the times they are respectful.

Sam described his interactions in terms of the treatment of the students. He stated that he came from a white bread school to a diverse population, and the disrespect is the same.

With our kids, I get no more disrespect than I got in the previous school I worked, and I didn't really get any more respect when I got there either...So to me, of course, it's different, but the kids are kids, even if they're the Latino, the Black kids the Middle Eastern kids with the South Asian kids that they act differently.

Based on the classroom observations, the interactions among the students is apparent.

Three of the seven participants described the culture and climate of KJSA to support culturally responsive leadership practices and distributed leadership. In particular, the participants explained the reasons parents prefer their children in a STEM program as well as described the open-door policy the administrator has about the types of culturally responsive leadership practices that are implemented within the STEM school.

For example, Debbie and Walter explained one of the reasons diverse students of the STEM school remain enrolled is that they believed that the school is a safe place for the students to learn. Debbie stated that "It's a safe environment, but they're still resistant [to learning]". Walter agreed that,

Parents are worried about safety, and they want to make sure that their kid is in a place that can keep them safe. And so that is where the problem comes in is that those kids aren't generally interested in STEM. So that's where we have the problem. I try to [create] the school culture and the climate. I think we have probably one of the best cultures in the district, and I pride myself on that.

Community outreach to parents and students. During the process of the data collection, I learned that there were several full-service community schools in the area as well as KJSA. According to the KJSA administrator, Walter, a full-service community includes access to food pantries, eye care, dentistry, and medical care that much of the community may not be able to afford. Sam enthused: “they just opened up the medical facilities so kids could get healthcare regardless of their health insurance.... They can get dental check-ups and pediatrician check-ups. And that's the part of the whole community approach that they're doing”. Tom was also enthusiastic about the services. “...there's even a soup kitchen.”

Walter elaborated that in addition to the full-service community center, parents share their culture with the community:

We are a full-service community school. So, they are working on a cultural night where the parents are going to bring food, and they're going to share their culture, and we do that on a more on a grand scale in terms of the whole building.

Another feature of community school supports empowering students in the community, and KJSA offers opportunities for students to participate in community service, which includes after school clubs and a robotics team. Four of the 7 participants

explained the opportunities a full-service community school offers to empower parents and students.

Walter explained about two of these service clubs:

We have a club called The Animal Support Club, it's tied to a partner called Saint Agnes's, an animal welfare center ...with pets for adoption [which] they spay and neuter ... and we immediately we had 25 kids immediately signed up for that club. It's sort of instructional, but it's also extracurricular. Also, they're learning a lot about engineering through the robotics team. So, we have three levels of engineering, sophomore level which is sort of an introductory level another where they take just a marking period of engineering and the things that they do in there are rudimentary, you know basic stuff then we have two pathway courses that are engineering principles with one and two and that is where they do more. Those are full-year courses, and they do a lot more in there. We just created a Makerspace.

Tom also commented on the clubs. "There's a lot of opportunities where kids get involved. There's Habitat for Humanity to do that once a year. They clean up the river. Those are all volunteering things". Tom also noted that they have tried to get a Parent Teacher Association started but have not been very successful.

However, Walter, an administrator, stated the difficulty of involving parents can affect the support of programs within a STEM school.

It's a challenge because we have a highly motivated group that is racially diverse.

... I think it would be good for the parents to come, but it's very, very, very difficult for us to achieve here in many of our high schools.

The reports from the teachers were confirmed when I found evidence of the access the parents and students of the diverse communities have to healthcare needs and extracurricular events from the flyers posted throughout the school provided to me throughout the school. The lesson plans documented the standards and content-related activities taught to the students, and the master schedule confirmed the types of extracurricular activities offered to the students.

Technology to support the communications to diverse parents. Technology to support the communication to diverse parents was a theme that emerged from the second research question. Three of the 7 participants suggested the technology portal as a culturally responsive leadership practice because it is a school-wide communication effort to empower parents by using technology to understand the progress of their child. The document that was provided to me by the administrator gives the parent a login and password to access the progress of their child. The form is written in English and Spanish. The challenge with the form designated for the technology portal was the translation is in two different languages, and there are 50 languages spoken in the city and school district.

For example, Sam, Janice, and Debbie expressed the technology portal was available to the parents. Janice further elaborated, "they've logged the parents on to the technology portal so they can see all the grades, and they have the robocalls when they go

home.” Janice further added, “the robocalls can leave messages for the parents...to keep parents updated, and the robocalls can be translated into different languages”.

Similarly, Alice noted,

We try and really be open. We'd love to get more parents in. I try so hard to get parents on our technology portal. So, I send pictures to parents of their kids' stuff, you know, if you wanted to, you could find this on the technology portal, so it's not a race thing per se but getting parent involvement.

Sam also acknowledged the technology portal, “and then there's, of course, report card night where the parents can sign up and receive updates on the progress of their child’.

Findings from the analysis document provided by the administrator and report card night provided evidence of the technology portal.

Challenges of Implementing Culturally Responsive Leadership Practices and Distributed Leadership for the Success of Students and Parents

Challenges of implementing culturally responsive leadership practices and distributed leadership practices for the success of students and parents were evident in three themes: language differences between the parents and students; cultural issues within the diverse student body; and student motivation, preparation, and absenteeism.

Language barriers among the parents and students. Five of the 7 participants described their experiences with the language challenges when implementing culturally responsive leadership practices and distributed leadership in a STEM school. The language barrier may prevent an understanding of the types of program implementation

for the parents and students of the STEM school. For instance, Alice stated that “Some of the students have language barriers. But it is astounding how many kids with a translator get over the language barriers if they have the desire so, like the South Asian kids”. Debbie, another teacher leader, agreed with Alice regarding pairing the students with another student that speak the language. “Yes, sometimes it's a language barrier. So, when I do with languages, I pair them up with someone who speaks the same language and English so they can translate”.

Similarly, Stella agreed there are language barriers in the classroom, but from a mathematics perspective, students may have language barriers, but the students can have excellent math skills. Stella explained

They're dealing with their language barriers, but I see it every day, and we try to address those every day, but in a math classroom, I know a lot of my students that are from those types of places their math skills are so good. Like sometimes they don't even need a calculator, and they tell us “I don't need a calculator”.

Sam chose to redefine the language barrier as the “language barrier of underachievement”.

We have the ESL students that are Spanish, the ESL students that are South Asian, and the ESL students are Middle Eastern. So, there's a whole mix of the biggest obstacle I seem to have is the language the underachieving African American students. So, the language barrier could be a kid that wants to achieve but can't go through that barrier. And then with the underachieving African

American students is really just apathy. That's really what it is for that population.

That's underachievement.

Tom addressed the support the school offers for the parents who have a language barrier.

We've always got somebody who speaks the language for that person and is able to interpret and help them. I'm sure some of the lack of parent participation is [because some] parents have to work two, three gigs so they can't come. They don't speak the language, or they might be afraid to.”

Based on the evidence from the documents on the parent login form of the technology portal and the full-service community school flyers translated in English and Spanish, the school has tried to address the language barrier with its dominant language groups.

Cultural issues within the diverse student body. Cultural issues within the diverse student body was a theme that emerged from the second research question. Three of the 7 participants stated differences among the diverse students within the STEM classroom. The administrator and teacher leaders expressed the hardships experienced with the interactions of the diverse student population in the STEM classroom. For example, Debbie stated that

a big problem is the Dominican students. They are not motivated and don't care...They have no respect for education...many of them, the boys just think they can be tough guys, and the girls are just kind of out for attention.

Debbie further shared,

There are some groups I don't pair together. Only because they don't seem to work well, so, for instance, with Arabic students, I try not to put the boys and the

girls together. They don't interact, and they work independently, and they just don't get along. The South Asian kids are usually okay to mix the group's, and they tend to work... from what I've seen ... the African American students seem to like to work independently”.

Sam, a teacher leader, and forensics/chemistry teacher acknowledged that he tries to approach the students as his authentic self, but that strategy does not seem to be effective because of the cultural differences. Sam felt that “the kids don't see me authentic to their experience. Even if I'm trying...with some of the kids, there's no level for me to talk to them”.

Alice also described challenges with the diverse students in the STEM classroom

In my classes, I have a lot of Muslim kids, a big giant generalization, but for the most part, the Muslim kids are better behaved than some of the others. Okay, because I believe they mainly come from two-parent homes where there's a parent at home to support them, and I don't think it's that other parents don't care, but if you're single... We have a lot of Black and Hispanic single moms here, unfortunately, so if your mom is going out and trying to put food on the table, really the fact that you wouldn't take off your sweatshirt in class... [is] really low down a list of things that she needs to deal with, but it starts to give the kids the idea that the rules aren't for them.

In my observations of the classrooms, the interactions of the students could be seen in the hands-on-group assignments demonstrated in the classroom. As I was observing the STEM classes, many of the students were working across culture except for the African

American student I witnessed. The African American student requested to work independently during a group assignment.

Two of the 7 participants described the deficit views that may hinder the progress of distributed leadership practices. Debbie recalled that if “Somebody has a prejudice or preconceived idea and they'll say you know; a kid just doesn't want to learn or I've tried everything just you know, let him do what he wants to do”. Sam noted however that “I think would be it a more lack of understanding of the cultural challenges”.

Student preparation, motivation, and absenteeism. Tom, a teacher leader/engineering instructor, expressed that student absences can deter the implementation of the culturally responsive leadership practices that could empower the diverse students. For instance, Tom told the story of a 10th-grade student who cuts class all the time and who in 9th grade “had a gazillion absences and their grades in the toilet”. He asked,

How did we let that kid slip through our fingers? We're just like letting this kid flow by and we're failing him at life, you know, we're not holding them accountable or her accountable and saying what do you know? What are you doing? And so, I'll reach the kid and find them and be like “look, you know, we're concerned, you have to graduate from high school. You don't have to graduate here. You know, I will [fail you] if you don't start getting it together”.

Janice, a teacher leader/behavior management pointed to the challenge of students coming with different levels of preparation for the course material.

One of the things that some of the students don't have as much of is science at the elementary level. So that is an obstacle because they come to us with different backgrounds. So, I have to work to make sure that everybody's on the same level. I might have to do a review. So, some students might need a little bit more support about the first time they hear it from other students. It's review for them. So, I do have to make sure they all build-up to the same level because, again, they're background in science is different.

Based on the evidence from the interviews and classroom observations, the cultural issues within the student body is apparent.

Summary

In Chapter 4, I gave detailed accounts of collection of the different types of data in this case study (interviews, observations, and school documents) and triangulation of the data in analysis, including the evidence of coding the subthemes and themes. I demonstrated evidence of trustworthiness by the credibility, transferability, dependability, and confirmability of the process and the findings. In Chapter 5, I will interpret the findings and discuss the interpretation of the results, limitations, and implications of the study.

Chapter 5: Discussion, Conclusion, and Recommendations

The purpose of this case study was to explore the perceptions of administrators and teacher leaders that implement culturally responsive leadership practices and distributed leadership practices in a public, secondary STEM school located in the mid-Atlantic region of the United States. Participant interviews were triangulated with classroom observations and school documents. The following research questions guided this study:

RQ1: What culturally responsive leadership and distributed leadership practices are used by administration and teacher leaders to empower parents and support the diversity of students choosing STEM classes in a racially diverse STEM school?

RQ2: What are the challenges in implementing distributed leadership and culturally responsive leadership practices to encourage more students of color to participate in courses in a STEM initiative curriculum?

The themes regarding the first research question were collaboration among faculty, striving for positive interactions with students, community outreach to parents, and technology to support communications to diverse students. The themes regarding the second research question were language difference; cultural issues within the diverse student body; and student motivation, preparation, and absenteeisms. In the following section, I interpret the findings in regard to the two research questions, first in relationship to the conceptual framework and then the empirical literature review.

Interpretations of the Findings

Interpretation in Light of the Conceptual Framework

Madhlangobe and Gordon (2012) described the implementation of culturally responsive leadership practices from the perception of an administrator in a school and the practices as including building relationships, being present and communicating, and promoting inclusive curriculum and instructional programs. At KJSA, building relationships were integral because participants perceived they created trust and respect among teachers and students. This was accomplished by teachers encouraging students to share knowledge and experiences and allowing students to express different life experiences. For example, Debbie, one of the teachers, described her interactions with the diverse students by saying, “In Advanced Placement Biology, we talk about ethics, we talk about research, and I’ll often ask them about their cultures how they feel about different things”.

The KJSA administrator reported he focused on being present and communicating to create a culturally responsive school environment and that he supported the culturally responsive school environment through strategic communication and collaborative walkthroughs. Sam, Janice, and Debbie described the technology portal that is available to empower parents as a means of communication to offer updates on the progress of their child. Janice stated, “they’ve logged the parents on to the technology portal so they can see all the grades, and they have the robocalls when they go home”.

Leaders who support culturally responsive leadership practices understand the specific needs of the students and can provide opportunities for their success (Davis,

2002). Promoting inclusive curriculum and instructional programs were administrative strategies to model cultural responsiveness for teachers. The administrator created the Adopt-A-Kid program to provide students with academic assistance. Walter, the administrator, explained,

We have a club called The Animal Support Club, it's tied to a partner called Saint Agnes's, an animal welfare center...with pets for adoption [which] they spay and neuter...and we immediately we had 25 kids immediately signed up for that club. It's sort of instructional, but it's also extracurricular.

The second part of the conceptual framework was effective distributed leadership, and this model, according to Malin and Hackman (2017), creates opportunities for leaders to come forth from the teaching staff and support positive changes in a culture designed to enhance participation. Walter, the administrator, explained, "A lot of teachers come to me and say, 'look, I found this can we do this,' and I usually say 'yes', unless it's some crazy thing." Bellibas and Liu (2018); Liu, Bellibas, and Printy (2016) and Symons (2005) explained the relationship between distributed leadership and a positive school climate that could lead to trust, mutual respect, and diverse instructional strategies. Indeed, Walter, the administrator felt that the culture and climate at KJSA were excellent and a major accomplishment.

Interpretation in Light of the Empirical Literature Review

In this subsection, I interpret the findings in relationship to the seven themes. The four themes that emerged related to Research Question 1 were collaboration among faculty, striving for positive interactions with students, community outreach to parents,

and technology to support communication to diverse parents. The three emergent themes related to the second research question were language differences; cultural issues within the diverse student body; and student motivation, preparation, and absenteeism.

Collaboration among faculty members. In analyzing the participants' perceptions of collaboration and its relationship with what they characterized as informal distributed leadership among faculty members, I found Malin and Hackman (2017) and Bellibas and Liu (2018) also reported that distributed leadership created a culture in the workplace to support the participation of teachers. The principal stated that KJSA had a culture and climate that was one of the best, and he was proud of the environment that was created by faculty collaboration. The principal also confirmed Cansoy and Parlar's (2018) findings that trust was a predictor of distributed leadership. The participants in the study reported that they trusted speaking to the administration about new programs and opportunities for the students because of the principal's open-door policy. Similarly, Chen (2018) found that distributed leadership functions positively and can create a positive school climate when leaders promote alignment with teachers and when teachers have equal involvement in the leadership practice.

Striving for positive interactions with students. Participants, both teachers and the administrator at KJSA with culturally responsive leadership practices, described the positive interactions among the diverse student population. Similarly, Simpkins et al. (2017) found the implementation of culturally responsive practices supported a positive relationship among the students. Madhlangobel and Gordon's (2012) reported that the culturally responsive leadership practices reflected the philosophy of the principal, such

as the teachers caring about students, a desire to see the culturally diverse students succeed, and building positive relationships, and were essential in supporting the education of the students. Several of the participants in this study of KJSA stated that the interactions with culturally diverse students are usually positive, and a discussion of their cultural background is able to occur between the teachers and students. For instance, one of the participants stated caring about the students created positive interactions among the students.

Community outreach to parents. Participants were asked to describe the types of community outreach that KJSA implemented for the parents of the diverse student population. Mayfield (2014) found that for students to become academically successful, the parents of a school need to be able to participate authentically in school activities, and from that participation, the school was able to create an environment that empowered stakeholders, such as parents. Mayfield also stated that the school was a community resource. One of the participants stated that KJSA offers a cultural night that is school-wide, and the families are able to share their culture with the community. Participants described that KJSA as a full-service community school, which offers medical, dental, and other healthcare needs for the parents and students of the diverse community.

Technology to support communication to diverse parents. KJSA supports communication to the diverse parents by a technology portal. The technology portal was offered online and allowed parents to view the academic progress of their child. I found that the technology portal was used to communicate the progress of the child to the parent; however, in Santamaria and Santamaria's (2015) study, the communication was

used to provide a detailed plan of the decision-making process to implement the culturally responsive leadership practices to members of the community.

Language differences. Mallinson and Hudley (2014) found that diverse student populations face experiences of cultural diversity, linguistic challenges, or academic inequalities that can hinder their success in STEM education. Similarly, 5 of the 7 teacher leaders stated that some of the parents and students have language barrier issues. The teacher leaders stated that in the classroom, the students are paired with other students that can speak the language to help their understanding of the content in the classroom. Another participant stated that there is a lack of parental involvement because of the language barrier between the parent and teachers. The school documents for the parents I reviewed, such as an explanation of the technology portal login and the posted flyers advertising the opportunities by the family community school, were written in 2 languages out of the 50 languages spoken in the community, which can hinder parental involvement because publications are not in a variety of languages.

Cultural issues within the diverse student body. Participants described the challenging cultural issues the students experience within a diverse student body. One of the participants discussed not pairing certain students together due to the racial and cultural tensions within the school culture, while other diverse students worked well together or independently. Another participant described cultural factors related to issues such as single-parent homes that challenged students in STEM classrooms. The types of data I collected did not give me a chance to focus on McGee's (2016) finding that African American and Latino students relied on coping mechanisms when facing racial

bias within the STEM classroom in higher education, such as stereotype management, which allowed them to excel in coursework better than anyone else in the course.

Student motivation, preparation, and absenteeism. Participants described weak student motivation, lack of preparation, and absenteeism as obstacles that can occur within the STEM classroom. I did not collect enough observational data to determine if the poor motivation was a result of poor teaching, as suggested by Lancaster and Yonghong (2017) who found African American college students did not finish their STEM degree because of several reasons, including the negative relationships with the teachers and the teachers were not passionate about the teaching field.

Limitations of the Study

One of the limitations of this study was the small sample size of participants. The original number of participants was eight (i.e., two administrators and six teacher leaders). This sample size was small, and it was not possible to interview one of the administrators; however, I had reached saturation by interviewing the teacher leaders. In addition, I chose not to interview the students because they were not included in the scope of the study and parents were too difficult to reach. As I was completing the classroom observations, I witnessed the interactions of the culturally diverse students but including them as interviewees was not feasible. I had planned on visiting the school for a full week, but due to the upcoming holiday, I completed the entire data collection process in 4 days. Other limitations include the self-reported nature of interview data; however, the observations and school documents confirmed the data from interviews with teacher leaders and the administrator.

Recommendations for Future Research

My recommendations for future research include focusing on culturally responsive leadership practices in an urban STEM school in light of the students' diverse faiths and traditions. Another recommendation for future research would be to complete a multiple case study of the strategies used to become an effective team using distributed leadership for at-risk students in an urban STEM school setting. A multiple case study might include both private and public STEM schools.

Another recommendation for future research qualitative study of the analysis of the relationship of parents with community leaders that benefit from the culturally responsive leadership practices implemented in an urban school setting. Assessing the types of culturally responsive leadership practices within public and private STEM school settings can give administrators the tools needed to support the students from the different settings which teachers and administrators may encounter in their careers.

Implications for Social Change

One potential impact of the study's findings for positive social change is to bring awareness of the support culturally diverse students need in a STEM school. Administrators and teachers may focus on the STEM activities performed in the school setting but may not have a fuller understanding of the dynamics of the types of culturally responsive leadership practices that could further support students' academic success in a STEM school. The implementation of culturally responsive leadership practices could support the interaction of students within a STEM school and promote the understanding of the traditions of individual cultures.

The use of distributed leadership could contribute to providing positive social change by helping organizations become efficient in creating emerging leaders that could give structure to the implementation of policies and practices that could support members of a community. In this study, I found the principal took efforts to support the STEM teachers in their ideas. Providing adequate support to students and parents from a diverse background may involve a team of talented teacher leaders who can provide insight into the classroom to guide students to success in a STEM school.

Conclusion

The purpose of conducting this study grew from my role as a STEM teacher for a public charter school system and my experiences with interacting with diverse students. Witnessing the struggles of diverse students within the STEM classroom, I wanted to understand strategies that could further the success of students from diverse backgrounds. Witnessing distributed leadership at KJSA allowed me to understand the process of implementing practices that could support or deter diverse students from becoming progressive citizens in the community. I wanted to add to the research literature by sharing findings that would provide administrators and teachers the knowledge and experiences of the impact of culturally responsive leadership practices and distributed leadership. I hope these findings help provide support for the administrators and teachers who may not have the experience with supporting diverse students and need more information to transform a school or school leadership team. The research-based information I have provided on the implementation of culturally responsive leadership

practices and distributed leadership can help an organization with diverse populations structure the success needed to create change in the lives of individuals and communities.

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Appendix A: Principal's Interview Protocol

1. Can you describe the interactions on a typical day with the racially diverse students as the principal or assistant principal of this STEM school?
 - a. Tell me more about the activities or experiences you witness from the racially diverse students in the STEM classroom.
 - b. Can you explain which racially diverse groups are more involved within the STEM classroom and why?
2. Can you describe the ways teacher leaders are needed to support the students that are less motivated within the STEM classroom?
 - a. Can you tell me in what ways distributed leadership used to build the student achievement and student self-efficacy in the students less motivated in the STEM classroom?
 - b. Can you describe how distributed leadership encourages students of color to participate in STEM courses?
 - c. Can you explain the advantage and disadvantages of using distributed leadership for decision-making?
3. Can you describe a couple of obstacles or difficulties you have experienced when implementing the STEM curriculum to the diverse group of high school students attending the STEM school?
 - a. How did you overcome the obstacles as an administrator?
4. How do you incorporate the culture of the students into the STEM curriculum?

- a. Which students have an appreciation of the culture within the STEM curriculum and why?
5. Can you describe at least 3 culturally responsive leadership practices that are implemented for the racially diverse students at your school?
 - a. Of the three culturally responsive leadership practices which increase the diversity of the students in this STEM school and why?
 - b. Why are a few disadvantages of implementing culturally responsive leadership practices at this STEM school?
 - c. Can you describe the types of races that most benefit and least benefit from these culturally responsive leadership practices and why?
 6. Tell me the ways the administration supports the future growth of teacher leaders for the support of racially diverse students?

Appendix B: Teacher Leader Interview Protocol

1. Can you describe the interactions on a typical day with the racially diverse students as a teacher leader of this STEM school?
 - a. Tell me more about the activities or experiences you witness from the racially diverse students in the STEM classroom.
 - b. Can you explain which racially diverse groups are more involved within the STEM classroom and why?
2. Can you describe the ways teacher leaders are needed to support the students that are less motivated within the STEM classroom?
 - a. Can you tell me in what ways distributed leadership used to build the student achievement and student self-efficacy in the students less motivated in the STEM classroom?
 - b. Can you describe how distributed leadership encourages students of color to participate in STEM courses?
 - c. Can you explain the advantage and disadvantages of using distributed leadership for decision-making?
3. Can you describe a couple of obstacles or difficulties you have experienced when implementing the STEM curriculum to the diverse group of high school students attending the STEM school?
 - a. How did you overcome the obstacles as a teacher leader?
4. How do you incorporate the culture of the students into the STEM curriculum?

- a. Which students have an appreciation of the culture within the STEM curriculum and why?
5. Can you describe at least three culturally responsive leadership practices that are implemented for the racially diverse students at your school?
 - a. Of the three culturally responsive leadership practices which increase the diversity of the students in this STEM school and why?
 - b. Why are a few disadvantages of implementing culturally responsive leadership practices at this STEM school?
 - c. Can you describe the types of races that most benefit and least benefit from these culturally responsive leadership practices and why?
 6. Tell me briefly about any future endeavors the leadership team is working on to encourage the support of racially diverse students to take STEM courses at this STEM school?

Closing

Do you have any questions for me? Is there any other information that you would like to share? I will send you a copy of the interview transcript for your records. Thank you for your time and participating in this study.