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Culturally Relevant Pedagogy in High School Science: Assessing the Implementation in Title 1 Classrooms

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Culturally Relevant Pedagogy in High School Science: Assessing the Implementation in Title 1 Classrooms

by

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Abstract

Culturally Relevant Pedagogy is defined as, using the cultural characteristics, experiences, and perspectives of ethnically diverse students as conduits for teaching them more effectively (Horowitz et al., 2018). Building relationships with students to understand their backgrounds and experiences to implement the best teaching practices such as accessing prior knowledge and making connections is imperative in a culturally diverse school with students with various learning styles, abilities, and interests. Moreover, the state of Georgia requires teachers to implement instructional practices relevant to students' culture and learning abilities to receive proficient scores on their yearly evaluations. However, the state must provide its teachers with the knowledge and training required to support students in these areas and to create classrooms that are culturally relevant in instruction and student interaction. In this study, teachers complete a self-audit evaluation of their culturally relevant classrooms, participate in interviews, and attend a focus group session, to assess how they are implementing culturally relevant pedagogical practices in their Title 1 science classrooms.

Keywords: culturally relevant pedagogy, title 1 schools, science instruction

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Dedication

This study is dedicated to my late Tee Rose (2/22/1952- 4/17/2022). I Thank You for giving me strength in life to accomplish all my goals. Thank you for seeing in me things that I didn't see in myself. I thank you for being my number one fan it is because of you I was able to finish this, your guidance and your love even in heaven have motivated me to be persistent and complete the work. I love you, miss you, and thank you. This study is also dedicated to my father the late Henry Joseph Ducre Sr. I spent many hours during this journey at your house to have some peace and quietness in order to get work done. I can't believe that God decided to take you two days before I reached the finish line. However, thank you for being the best dad you knew how to be. Your love for me could move a mountain and I am blessed to have had you as a father and appreciate all the many lessons you instilled in me. I am very much so the woman I am today because of the father I had in you. I love you and pray I continue to make you proud. Love your favorite child.

I would also like to dedicate this research to all the black and brown girls that I have taught, that I will teach, or that I may never encounter. Who you are now and what you've done in the past, doesn't determine what you'll be in the future. Don't let society define you by your mistakes or your past. The sky is truly the limit, keep faith in yourself that you can do all things through God who gives you strength.

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Chapter 1: Introduction

> The scientist is not the person who gives the right answers; he is the one who asks the right questions.
>
> –Claude Levi-Strauss

As a mother of an elementary-aged son of color, every day I am greeted with many questions about how things work, why various phenomena exist, and what words mean, amongst a ton of other questions. His hunger for knowledge drives his curiosity and ignites his desire to ask numerous questions to solve whatever problem lingers in his mind. He is at times annoyingly inquisitive however his persistence to solve problems in his little world allows him to practice and strengthen his science skills each day, making him one of the smartest eight-year-olds I know. Many children start life like my son, with a passion for asking questions of how, what, and why the world and things that inhabit it function the way they do. At this age, children are housed with excitement and look forward to classes such as art, English language arts (ELA), and science, but too often as they get older the curiosity dies, and they become less inquisitive about phenomena in the world. Causing the excitement for classes such as science to no longer exist. I have witnessed this as a secondary science teacher. As students enter middle grades and high school, they are no longer looking to ask the right questions as to how and why things work, and their interest in the arts, ELA, and science begins to diminish. They become more consumed with the happenings of social media, survival, and relationships of the world around them and less concerned with scientific phenomena. It is at this point teachers must expand their instructional and pedagogical practices to appeal to students' interest in making what they are teaching relevant to the students in their classrooms.

Problem Statement

As high school teachers, we anticipate students have the academic maturity to complete assignments that require students to be accountable for their learning. However, in Title 1 schools that is often not the case (Title 1 school that receives federal funding based on the low economic status of its student population). Therefore, teachers are required to assist students with developing this form of maturity and accountability. However, given many high school science teachers minimal knowledge or preparation to teach students who do not have these prerequisite skills, teachers become intimidated and frustrated in their attempts to create independent learners. Teachers must be equipped with culturally and academically relevant pedagogical instructional practices to enhance the learning needs of marginalized students and create independent learners within socioeconomically disadvantaged communities, in hopes of decreasing the achievement gap between them and their more affluent peers. As a result, this study seeks to assess how high school teachers at Title 1 schools are implementing culturally relevant pedagogy to meet the academic and cultural needs of the students in their science classrooms.

According to Norman et. al (2001), the educational achievement gap that exists between children of color and White children are among the most pressing issue of today." In the state of Georgia, it is evident that the achievement gap is prevalent on state standardized tests such as the end of grade (EOG) eighth-grade Milestone Assessment and the end of course (EOC) Georgia Milestone Assessment for Biology. According to the Georgia Department of Education website, the percentage of students proficient on the eighth grade Science Milestone and Biology Milestone for the 2023 school year were 26% and 40% respectively. Cooley et. al (2021) state, classes with a high percentage of minority students tended to be lower in quality of intellectual

rigor and sense-making. Teaching in Title 1 schools this is often the case. Zaretta Hammond states in her book *Culturally Responsive Teaching and the Brain* (2015), that the achievement gap has created an epidemic of dependent learners amongst marginalized students (such as English Language Learners [ELL], socioeconomically disadvantaged students, and students of color), resulting in students that are unprepared to complete higher ordering thinking task, creatively solve problems, and analytically read and write to meet state curricular standards. This is often the conversation with colleagues who are also educators at Title 1 schools. Many of them state their day-to-day instruction consisted of completing vocabulary practices, having students' complete notes, or watching videos to teach the students the content. Very rarely did they state that they implemented strategies that required the students to think beyond the information given to them explicitly by the teacher. In the instances in which this form of instruction was discussed, the colleagues taught the students in the Advance Placement (AP) or Magnet courses. Moreover, when teachers are asked to incorporate strategies that require students to use higher-order thinking skills such as Project Based Learning or Inquiry-Based Learning activities, teachers shy away from implementing these practices within their classrooms because their marginalized students are not accustomed to completing tasks that require them to be independent learners. Oftentimes, the attempt to develop independent learning activities amongst marginalized students requires extensive time, effort, and scaffolding from the teachers. However, due to the demands of the classroom teachers are limited in the time they have to develop the skills students need to become independent learners. In an editorial written by Tofel-Grehl et al. (2022), the authors suggest that the role of the more effective STEM teachers is the role of the facilitator. However, when students lack academic independence due to excessive scaffolding, learning deficits, or teachers' inability to take risks, student achievement gaps in science exploration and

ultimately state standardized testing continue to increase. Students are required to use higher levels of Bloom's Taxonomy such as analyze, synthesize, and evaluate to answer questions on state assessments, yet have not been required to complete tasks or assessments within their classrooms throughout the course of the semester that have challenged their thinking or increased rigor.

Table 1

Biology End-of-Course Student Achievement

				Percent in achievement level			
	Number tested	Mean	*SD*	Beginning learner (scale score range: 140 to 474)	Developing learner (scale score range: 475 to 524)	Proficient learner (scale score range: 525 to 608)	Distinguished learner (scale score range: 609 to 820)
All students	140,303	519	74.3	30%	24%	32%	13%

Note. This table was adapted from the Georgia Department of Education website and contains the EOC Milestone data for the 2023-2023 Biology Assessment.

Table 2

8th Grade Biology End-of-Grade Student Achievement

				Percent in achievement level			
	Number tested	Mean	SD	Beginning learner (scale score range: 165 to 474)	Developing learner (scale score range: 475 to 524)	Proficient learner (scale score range: 525 to 592)	Distinguished learner (scale score range: 593 to 785)
All students	94,539	489	63.1	47%	27%	20%	6%

Note. This table was adapted from the Georgia Department of Education website and contains the EOG Milestone data for the 2023-2023 8th grade Science Assessment

Additionally, the state of Georgia uses a ten-standard evaluation scale to evaluate the state's educators. The Teacher Keys Effectiveness System (TKES) is a system developed to assess teacher effectiveness and create consistency amongst comparability in the state of Georgia (Georgia Department of Education, 2012). The system is divided into ten performance standards broken down into five primary standards planning, instructional delivery, assessment of and for learning, learning environment, and professionalism and communication. Within these ten standards, teachers can earn a rating between levels one and four. Teachers performing at level one does not use research-based instructional strategies and do not implement instructional strategies relevant to the content area. The strategies the teacher uses do not engage students in active learning or acquisition of key skills (Georgia Department of Education, 2012). Teachers receiving the rating of a level two inconsistently use research-based instructional strategies. The strategies used are sometimes inappropriate for the content area for engaging students in active learning or for the acquisition of key skills (Georgia Department of Education, 2012). To receive a rating of a level three, the teacher must consistently promote student learning by using research-based instructional strategies that are relevant to the content engage students in active learning and facilitate the students' acquisition of key skills (Georgia Department of Education, 2012). A proficient rating of Level four is given to teachers who continually facilitate student engagement in metacognitive learning, higher-order thinking skills, and application of learning in current and relevant ways; in addition to being teacher leaders (Georgia Department of Education, 2012). Two of the ten TKES standards require teachers to be culturally relevant in their practices to receive proficient scores. Performance Standard one: Professional Knowledge states "The teacher demonstrates an understanding of the curriculum, subject content, pedagogical knowledge, and the needs of students by providing relevant learning experiences by

displaying an understanding of the intellectual, social, emotional, and physical development of the age group" (Georgia Department of Education, 2012). While Performance Standard seven suggests, that the teacher provides a well-managed, safe, and orderly environment that is conducive to learning and encourages respect for all. Examples include promoting respect for and understanding of students' diversity, including – but not limited to – race, color, religion, sex, national origin, or disability (Georgia Department of Education, 2012).

Significance of the Study

Education in the United States has undergone many reforms since the inception of formal educational systems. Yet, science education experienced perhaps its most significant reform in the 1950s with the launch of Sputnik 1 by the Soviet Union. Before the launch of Sputnik 1, the United States was a pioneer in the fields of medical research, automobile development, and electronics (Wissehr et al., 2011). During this time there was not an emphasis on science courses if students were not intending to explore scientific careers, with courses such as physics and chemistry not being offered in 23% of American high school classrooms (Wissehr et al., 2011). However, in the United States' attempt to compete with the Soviet Union, President Dwight D. Eisenhower implemented the National Defense Educational Act. This act called for a change in curriculum starting at the elementary level, encouraged students to attend school beyond high school, and distributed scholarships to those students' pursuing careers in science, mathematics, engineering, or foreign languages (Hunt, 2023). This reform became known as the "golden age of science education" (Wissehr et al., 2011) and led to a significant difference in science education as we know it today.

The No Child Left Behind Act (NCLB)was signed into policy in 2002 by President George W. Bush. This policy is considered one of the most significant overhauls and expansions

of the federal education act of 1965 with the Elementary and Secondary Education Act passed by President Lyndon B. Johnson (McGuinn, 2006). The act sought to hold schools and teachers accountable to meet specified federal expectations through student standardized assessment scores (Blanford, 2011) in an attempt to improve student reading and math abilities at consistently low-performing schools. According to McGuinn, (2005), failure to meet federal expectations through student performance could result in the defunding of federal support, the ability for students to attend out-of-district schools, the replacing of staff, and ultimately the closing of schools.

The implementation of the NCLB Act shifted the federal involvement in state and local educational programs and policies, creating mandates on a federal level. These mandates included, students taking standardized tests once a year in grades 3–8, the creation of statewide standards, and the requirement that all teachers in core subjects be highly qualified (McGuinn, 2005). Due to this shift of federal involvement in schools, states were required to create common standards that all public schools were required to implement in preparation for state-standardized evaluative assessment. The assessment would then be administered to all students in the state despite their socioeconomic status, English language proficiency, or learning abilities and used as comparative data to determine the school's "success". The data would then be desegregated by various groups including major races, ethnicities, disability, and English proficiency (McGuinn, 2005), and used to make decisions.

Though the NCLB Act gained bipartisan support amongst the Democrat and Republican parties, the act also had many who opposed the interference of the federal government in traditionally state and local affairs. "Opponents of NCLB argue that high-stakes testing hurts students by causing anxiety and driving instruction in undesirable ways". They also contend that

testing students more frequently would not improve instruction or student learning (Wei et al., 2015). Moreover, the focus of NCLB on the subjects of math and reading came at the expense of other equally important subjects such as science. According to Jennings and Rentner (2006), 71% of districts were reducing instructional time in other subject areas to meet NCLB requirements. This was the case in 97% of districts with high poverty in comparison to 55–59% of lower-poverty level districts (Jennings & Rentner, 2006). Though the NCLB Act has been revised since the Bush administration, there is still a heavy emphasis on the subjects of math, reading, and ELA.

In 2015, the Obama administration passed the Every Student Succeeds Act (ESSA). The act replaced the NCLB Act of 2001 and reauthorized the Elementary and Secondary Education Act of 1965 (Saultz et. al, 2017). The new act continued to require states to implement annual high stakes testing and report data but allowed states to be more flexible in their ability to determine accountability measures (McGuinn, 2016). Since the development of ESSA, the state of Georgia has implemented the TKES. This system measures teacher effectiveness by assessing teachers on ten Performance Standards. Like Georgia, the ESSA allowed for the state to have autonomy in developing its teacher performance measures.

After the implementation of NCLB which sought to hold teachers and schools accountable for student growth and performance, the focus of instruction changed across the country. According to Jennings and Rentner (2006), with NCLB there became an increase in curriculum and instruction that aligned to assessments. Instruction was then modified based on the assessment data (Jennings & Renter, 2006). Wei et al. (2015) state, that opponents of the act argued NCLB drove undesirable instructional practices such as teaching to the test, while too much time was dedicated to high stakes testing that was used to evaluate teachers. While Jahng

(2011) states, that standards-based learning discourages other ways of thinking and behaving, causing minority students to undergo assimilation. The need for schools to meet adequate yearly progress resulted in changes in instructional practices as teachers began instructing students to pass state standardized assessments. Moreover, Race to the Top, an initiative developed as a continuation of NCLB by the Obama administration, sought to advance educational reforms by rewarding high-achieving schools with additional funding (Jahng, 2011), which impacted teacher performance and accountability.

Being a teacher in a post-NCLB era entails practices such as teacher evaluations, yearly high-stakes testing, and standards-driven instruction. The pressure for teachers to increase student achievement levels on state-mandated assessments is often the primary focus in meetings, classroom instruction, and School Improvement Plans. With schools aiming to meet state requirements and to increase and maintain high College and Career Ready Performance Index in the state of Georgia, instruction is standards-driven despite student demographics. Curriculum standards are created by the state (as required by NCLB) with all public-school teachers required to teach these standards. As a result, test scores are often higher in more affluent schools and districts. Mensah (2021) states, that increasing diversity in terms of race, ethnicity, and culture brings challenges in meeting the needs of all students. As a high school educator in a Title 1 school, teachers must find more creative ways to meet the academic needs of the diverse students in which they teach. When students do not possess the background knowledge needed to meet the standards set by the state, teachers must develop lessons that are not only engaging, and academically challenging, but also gap-filling. The most effective way in which to do so is through the creation of Culturally Relevant Pedagogy. For this to occur in the science classroom, it often requires teachers to incorporate outside resources. According to

Mackenzie (2021), being a Culturally Relevant Teacher means building bridges between the community and classroom by engaging students in authentic science allowing them to express their knowledge in ways in-class work does not. However, in a post-NCLB era, with high-stakes testing developed from state-created standards and strict pacing guides to meet testing deadlines, effective instructional practices such as community involvement and exploration suffer. In this instance, teachers fail to fully implement culturally relevant teaching, and students in Title 1 schools fail to meet the state-created standards and be as successful as their peers in non-Title 1 schools on state high-stakes assessments. The focus on teacher accountability, through student achievement often forces teachers to forego some of their effective instructional practices to meet strenuous deadlines that ultimately leave students suffering from ineffective teaching. This study is significant as federal and state decisions are continuously impacting decisions in education. Most of these decisions are made with a large focus on minority student achievement. Effective culturally relevant institutional practices suffer as a result of, decisions made toward student achievement and teacher accountability.

In a study conducted during my coursework, I led a survey for all the science teachers at a Title 1 school. In this study, teachers were asked to examine their culturally relevant classrooms, after reviewing the results I found that many of the teachers weren't aware of the cultural diversity of the students in their classroom, did not have visual representation of diversity in their classrooms, were not creating various grouping and learning opportunities for students to demonstrate their knowledge, and were not reflective of what and how they were meeting the needs of their students. Furthermore, many teachers expressed they lacked in-depth knowledge of culturally relevant pedagogical practices and could use support in that area. The

results of this survey prompted my interest in assessing the implementation of culturally relevant pedagogy within the high school science classroom, hence leading to this current study.

Relevance to Teacher Leadership

Teacher Leadership is defined as, "the process by which teachers, individually, and collectively, influence their colleagues, principals, and other members of the school communities to improve teaching and learning practices with the aim of increased student learning and achievement" (Conan Simpson, 2021). As a teacher leader, in both my school and district, I am obligated to acknowledge and refine deficits within my school instructional practices, culture, and climate. This has compelled me to address my problem of practice.

Understanding the implementation of culturally relevant pedagogy in science is relevant to the study of Teacher Leadership. Understanding teacher's strengths and weaknesses in demonstrating culturally relevant practices within their classroom, will aid in developing intentional professional development sessions, providing teachers with appropriate resources, and ultimately increase teacher efficacy in the classroom. Levin and Schrum (2017) state, that teacher leaders are those who lead in various formal and informal ways in their classrooms, districts, and communities. By creating a true Culturally Relevant science classroom teachers must develop a connection between the community and the classroom. In doing so, teachers must venture out to develop relationships with personnel within their school's community to enhance student learning.

This study will allow teachers, building leaders, and school districts to evaluate the effectiveness of instruction to meet the needs of minority students in their districts while being reflective on ways to increase the use of best practices in science education. Through this study, teacher leaders will be empowered to advocate for the needs of their students as well as for

themselves and future teachers, within teacher preparation programs and professional development sessions. Moreover, this study will reveal the lack of support and knowledge teachers have towards expected practices. While teachers are expected to create culturally relevant content that is engaging yet meets state-created standards, they are often not equipped to do so. Through this study, teacher leaders will have to ability to assess ways to integrate culturally relevant pedagogy into their instruction with confidence while addressing the standards set forth by the state of Georgia.

Chapter 2: Literature Review

The literature collected for this literature review was procured from digital databases to develop in-depth knowledge of the research related to culturally relevant pedagogy and science instruction; specifically, as related to Title 1 teachers and their instruction in a high school science classroom. The literature reviewed in this chapter encompasses two major sections. The first section of the literature review begins with a comparative overview of culturally relevant pedagogy and culturally responsive pedagogy. Next, it addresses four themes that arose throughout the study of various literature relative to culturally relevant pedagogy and its application in the science classroom. The first theme is lack of time. This theme discusses the constraints science teachers have in their classroom that impedes their ability to effectively implement culturally relevant pedagogy in their classrooms. The literature then critiques teacher preparation programs and how they prepare student-teachers to educate culturally and linguistically diverse students. Next, the literature discusses how the lack of emphasis on science content in elementary school, contributes to student achievement gaps in science. Lastly, the literature review delves into how professional development is needed to assist teachers in creating lessons that are culturally relevant to the students in which they teach.

Theoretical Framework

Hammond (2015) defines culturally responsive pedagogy as, “the process of using familiar cultural information and processes to scaffold learning. Emphasizing communal orientation, focusing on relationships, cognitive scaffolding, and critical social awareness”. Dr. Geneva Gay (2020), described culturally responsive pedagogy as an appropriate approach to help marginalized students, used to pursue social justice utilizing creating cultural continuity between students’ home and school environment. Gay and Chen (2020), also state:

> Culturally responsive pedagogy that supports student learning styles may be field-dependent or field-independent. Children accustomed to field-dependent learning styles might be easily affected by their environment and prefer working collaboratively, while the latter would prefer to work individually. Therefore, it is important to understand individual student learning styles and adopt appropriate strategies.

Hammond and Gay assert that culturally responsive pedagogy is meeting the academic needs of students by implementing instructional practices that are culturally and cognitively appropriate for the students in which we teach.

Culturally responsive pedagogy is not to be confused with culturally relevant pedagogy. A practice that is closely related and very important in closing the achievement gap between more affluent and marginalized students. Dr. Gloria Ladson-Billings defines culturally relevant pedagogy as, “teaching that empowers students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitude” (Ladson-Billings, 2022). Culturally relevant pedagogy emphasizes the creation of curricula and instruction that are relevant to the cultural experiences and influences of the students being taught. In contrast to culturally responsive pedagogy which focuses on the development of strategies based on students’ cognitive learning abilities; culturally relevant pedagogy accentuates instructional strategies that the students to whom we teach can relate based on cultural practices. Aronson and Laughter (2016), delineate these two by stating one focuses on teacher practice (culturally responsive pedagogy) while the other focuses on teacher posture and paradigm (culturally relevant pedagogy). Based on this information, the conceptual framework that best supports this study is grounded on the tenets of culturally relevant pedagogy.

Culturally responsive pedagogy is a framework that aims to enrich the learning outcomes of culturally and linguistically diverse students (Kondo, 2022). The theoretical frameworks of culturally responsive, culturally compatible, culturally appropriate, and culturally congruent education emerged in academic literature around the 1960s–1970s to provoke more effective teaching for students of diverse backgrounds (Aronson & Laughter, 2016). Supported by the works of multicultural education pioneers James Banks, Geneva Gay, and Sonia Nieto; Dr. Gloria Ladson-Billings coined the term culturally relevant pedagogy (Saint-Hilaire, 2014). Dr. Gloria Ladson-Billings defines culturally relevant pedagogy as, "a theoretical model that not only addresses student achievement but also helps students to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools (and other institutions) perpetuate" (Ladson-Billings, 1995). In 1989, Dr. Ladson-Billings developed the term culturally relevant pedagogy in an article, *The Tale of Two Teachers: Exemplars of Successful Pedagogy for Black Students*. In this article, Dr. Ladson-Billings completes a case study in a small predominately black district. She completes her case study on eight teachers who have been identified as effective educators by district stakeholders. Of those eight effective teachers, Dr. Ladson-Billings recognizes two teachers who create lessons and resources that are engaging and effective by making personal and cultural connections with the Black students they teach (Ladson-Billings, 1989A). Ladson-Billings (1989A) defines these teachers as being culturally relevant due to the important dimensions of conceptions they exhibit. These conceptions are conceptions of self/other, conceptions of classroom and social relations, and the conception of knowledge and content allow the teachers to create culturally sensitive environments for their students that foster relationships, academic rigor, and student engagement.

From this case study, Dr. Ladson-Billings went on to conduct detailed research on the practice of culturally relevant pedagogy.

In her article *Toward a Theory of Culturally Relevant Pedagogy,* Ladson-Billings found that three propositions arose from the exemplar of culturally relevant teachers in this study. Those propositions that made them exemplary teachers were their conceptions of self and others, how social relations are structured, and the conceptions of knowledge. When teachers were successfully culturally relevant in their pedagogy through conceptions of themselves and others, they exhibited the following characteristics: believing that all students were capable of academic success, seeing pedagogy as art, seeing themselves as members of the community, and seeing teaching as a way to give back to the community, and believe in the Freirean notion of "teaching as mining" (Ladson-Billings, 1995). These teachers expected high levels of performance from their students and took risks by being deliberate in their commitment to the school community and making connections to the community in their instruction (Ladson-Billings, 1995). Moreover, to improve student achievement, these teachers created social interaction that fostered academic success (Ladson-Billings, 1995). These interactions increased cultural competence and critical consciousness within teachers, this was done by teachers maintaining open student-teacher relationships, showing a connectedness with every student, and developing a community of learners while encouraging students to learn collaboratively and have a responsibility for one another (Ladson-Billings,1995). As a result of these social relations practices, these successful culturally relevant teachers fostered classrooms in which teacher-student relationships were equal and reciprocated (Ladson-Billings, 1995). The third premise that emerged for Ladson-Billings' 1995 study was the conception of knowledge. Teachers that Ladson-Billings (1995) deemed as successful culturally relevant teachers viewed knowledge as critical, to be shared,

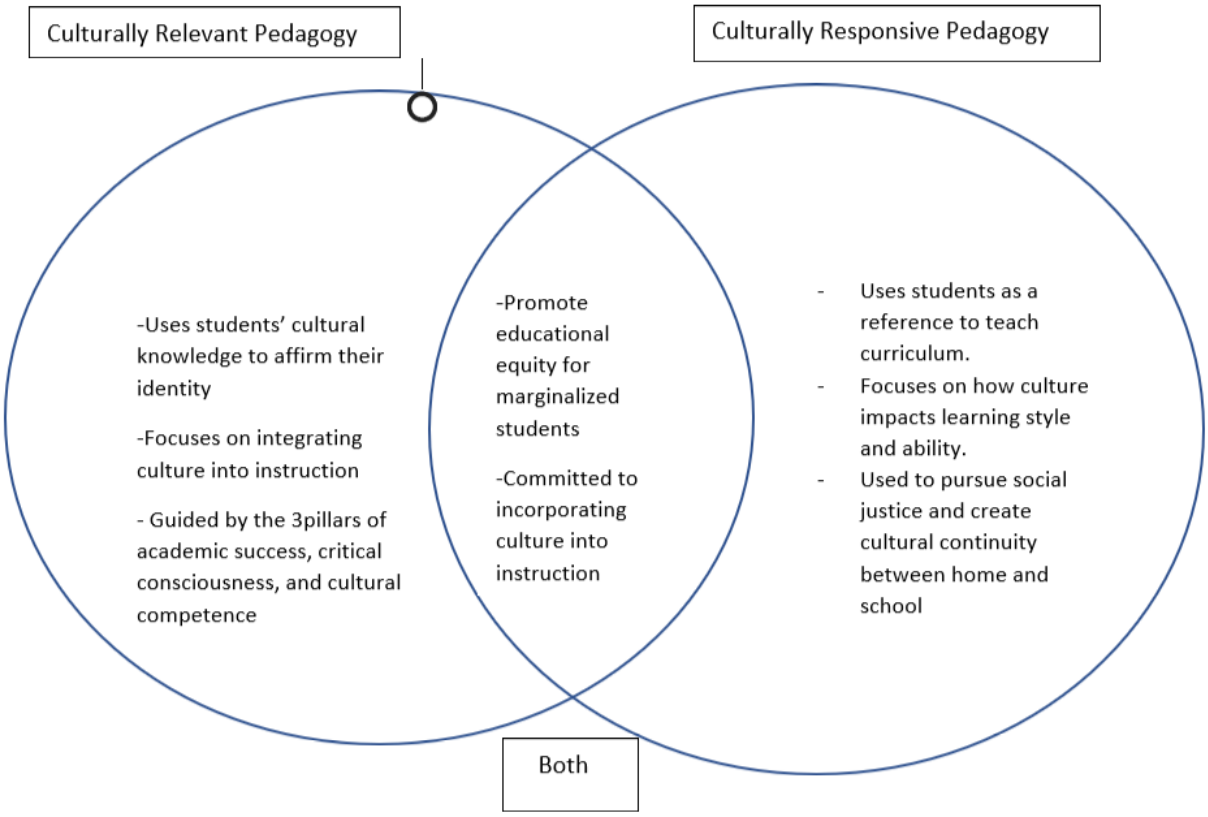
recycled, and constructed. These teachers also had a passion for knowledge and learning, providing scaffolding, and used multifaceted assessments (Ladson-Billings, 1995). Dr. Ladson-Billings concluded her study by suggesting educational researchers re-educate prospective teachers to understand their culture as well as others and how they impact education (Ladson-Billings, 1995). Moreover, she suggests that a culturally relevant pedagogy is created to problematize teaching and promote education. Through the use of culturally relevant teaching in science, teachers can make abstract concepts more concrete. This provides students with a visual or tangible idea that applies to them and their experiences.

Culturally responsive pedagogy is characterized by teachers who are committed to cultural competence, establish high expectations, and position themselves as both facilitators and learners (Samuels, 2018). To increase students' understanding and performance in the science classroom teachers must meet students where they are academically through the use of analogies, references to prior knowledge, and activities that students will find engaging. To do so, teachers must build relationships with their students and learn and understand their backgrounds, cultures, and interests.

For this study, I will use the pillars and conceptions of culturally relevant pedagogy as they pertain to science and science instruction. As a Title 1 science teacher post the COVID-19 pandemic we must not connect our content to students' cultural, social, and emotional needs and differences. However, we must address pandemic and cultural deficits through the understanding that many of the students we teach and serve are dependent learners who lack the skills required to meet and succeed in the standards outlined by the Georgia Department of Education.

Figure 1

Culturally Relevant Pedagogy Versus Culturally Responsive Pedagogy



Themes in the Literature

Lack of Instructional and Planning Time

Content standards, statewide assessment, and accountability are issues of national importance that guide current education practices in the United States (Shaver et al., 2007). These issues also heavily impact science instruction in classrooms nationwide, oftentimes limiting the time educators have to effectively implement instructional practices to meet the needs of culturally and linguistically diverse students such as culturally relevant pedagogy. Moore Mensah (2011), states planning, teaching, and assessing a curriculum that is grounded in

principles of culturally relevant pedagogy demands a lot of time and effort. Teachers in a study by Underwood and Moore Mensah (2018), agreed by reporting they did not have the time to use or incorporate culturally relevant pedagogy into their instruction due to the rigor of the content. Furthermore, Shaver et al. (2007), argue teachers must sacrifice between depth and coverage to effectively implement culturally relevant pedagogy in their science class. Johnson (2011, states "High-stakes testing on curriculum that doesn't have a culturally competent focus makes it complicated for teachers that are torn between assessing students' factual knowledge and critical thinking/social connectedness". Due to the NCLB Act teachers are required to follow an instructional framework that consists of deadlines and time frames in which students are expected to meet state-mandated standards. As a result, these expectations do not allow teachers to plan, implement, and assess students effectively using the three culturally relevant pillars. Instead, teachers may resort to using the pillars that are easiest to apply or they sacrifice the implementation of culturally relevant pedagogy to ensure they are covering each standard. In this instance, depth is sacrificed for coverage. However, Horowitz et al. (2018), contend there are ways teachers can effectively implement culturally relevant pedagogical practices in their classrooms without sacrificing time or content. The authors state, that using culturally relevant analogies in classroom examples helps students to visualize materials more effectively (Horowitz et al., 2018). Though I agree that the use of analogies is effective in making science concepts easier for students to visualize, often these analogies are surface-level and do not allow for an in-depth understanding of the content. Additionally, Lederle and Moats (2022) state that teachers should reflect and carefully plan how they will incorporate culturally relevant pedagogy into their instruction. With such strict schedules and planning periods that are often dominated by meetings, professional development, and other administrative demands teachers do not have time

to create culturally relevant pedagogy lessons. Morrison et al. (2008) corroborates, that teachers need time with colleagues to develop curriculum, time to build relationships with students, and the ability to engage with the community and families. Without adequate time to develop relationships with students and the community, teachers cannot effectively develop lessons that meet the cultural needs of the students they teach. As a result, the implementation of the lesson with focuses on the pillars of cultural competence and social consciousness suffer.

Teacher Preparation Programs

Most educators teach their students the way they were taught. Whether that be the way they were taught as a child in primary or secondary school or if they implement strategies introduced to them in their teacher preparation programs. Whichever instance, an educator's prior role as a student impacts their role as a teacher. Boutte et al. (2010) stated "Culturally relevant pedagogy assumes the way the teacher teaches profoundly impacts students' perceptions of the content". To meet the academic needs of students, teachers must understand the cultural needs of the students they serve to make the content applicable to those students. However, Mensah (2011) argues that for preservice teachers to teach using culturally relevant practices they must have support in the form of collaboration with a diverse group of others so that they can have success in planning and teaching. If teachers are expected to use culturally relevant approaches in their classrooms, teacher preparation programs must offer courses to prepare for the implementation of these practices in their classrooms. Although multicultural science education courses have been advocated for by researchers, traditional preservice programs in the United States have not incorporated them into their curricula (Brown, 2017).

Laughter and Adams (2012) sought to confirm the connection between adequate teacher preparation and student success. In a study conducted in a middle school, Laughter and Adams

presented a middle school teacher with practices based on the tenets of being culturally relevant to her students to increase their scientific knowledge. In this study, they concluded that culturally relevant science teaching is an important tool that might convince practicing science teachers and teacher educators to begin to understand science in new ways (Laughter & Adams, 2012). Additionally, Underwood and Mensah (2018) state that due to the increase in diversity and science achievement gap, science teacher educators must prepare preservice teachers to consider race and culture in engaging all students.

With education being many high school teachers' second career, teacher preparation programs must be intentional about preparing teachers to teach culturally diverse students. As schools and districts struggle to retain teachers, assessing teacher preparation programs to incorporate courses that emphasize instructional practices for culturally and linguistically diverse students or students in Title 1 schools may increase teacher retention while dually increasing student success. However, it cannot be the expectation of school and district leaders of their staff to respond to their students' cultural needs if teachers are ill-prepared. We should view teacher knowledge as resources to be activated, employed, and shaped during teacher education experiences (Gray et al., 2022 as cited in Mathis et al., 2023).

Professional Development

Professional development covers different forms of formal and informal learning undertaken by teachers after they have completed their pre-service education (Ivanova et al., 2022). The most effective teachers are consistent students. Teaching is a career that is always growing and changing. Teachers must devote themselves to continuously learning new instructional strategies, advancing with technology, and creating content relevant to an ever-changing society and trends. Becoming a culturally relevant science teacher is a career-long

process, not something obtained from a short professional development session (Mackenzie, 2021). Providing teachers with research-based professional development that is relevant to the students they serve is imperative in developing a staff that has a primary goal of student success. Transformative professional development focused on teaching for equity and culturally responsive pedagogy should "authentically address teachers' needs to drive their learning, consider the specific context, develop an understanding of sociopolitical injustices, and promote collaboration" (Riordan et al., 2019, p. 330 as cited in Mack, 2021). Ngcoza and Southwood (2015) state that knowledge-capacity-building is essential for teachers to be effective in their classrooms. Teachers must be trained through effective professional development sessions to meet the expectations in the classroom.

In the article *Professional development networks: From transmission to co-construction. Perspectives in Education*, Ngcoza and Southwood discuss transformative continuous professional development (TCPD) with an emphasis on the 3 R's, responsibility, reciprocity, and reflexivity. Ngcoza and Southwood state, that in TCPD responsibility occurs as a result of members being part of a group and assigned roles within these groups. Members must be participatory and aware of their roles within different contexts in the group and participate in various ways. Through reciprocity, a TCPD network is described as a style of negation where teachers obtain the role of co-learners to provide a platform for them to be comfortable and expressive while maintaining mutual respect for one another. For the 3rd R, reflexive practice alludes to the practical knowledge of action research by teachers. Reflexivity in a TCPD network can be practiced in novice or veteran teachers and contribute to the production of knowledge aids and understanding and gaining insight into the social world.

In *Developing Paradigms, Patterns, and Mechanisms for Science Teacher's Professional Development in Area-Based Networks in Thailand* the author Nattakit Sawadthaisong (2021)

seeks to improve student learning through the implementation of area-based professional development for teachers. In the article, Sawadthaisong details how the performance of schools and students is not only tied to the curriculum being taught but also to the teachers who develop and teach the curriculum. Sawadthaisong's two objectives in the article are to study current and desirable conditions for the paradigm, pattern, and mechanism for science teacher professional development and to develop paradigm, patterns, and mechanisms for science teacher professional development that are consistent with the need for educational institutions according to priority agenda. The author does this in two steps. Step one consisted of studying the current and desirable conditions for science teacher professional development. Step two consisted of examining the paradigm, pattern, and mechanism for science teacher professional development. To complete these steps data was collected from annual performance reports, human resource management, and academic services for science teacher development. Sawadthaisong then examined the paradigm, patterns, and mechanism for science teachers and developed a draft for area-based network professional development that was consistent with the key priority agenda for development. From this study, Sawadthaisong found the desired conditions of the pattern for science teacher professional development were offline and on-the-job training through action-based learning. As well as an organization mechanism that consists of school and network professionals. Sawadthaisong concluded from this study that science teacher's professional development has to be suitable for teachers' needs and students' outcomes with an emphasis on student outcome-based learning. I concur with this study as teachers are more likely to implement resources and materials obtained in professional development sessions when those materials are relevant to the teacher and the students in their classrooms.

Moreover, systems cannot hold teachers to an expectation and not provide teachers to be successful in meeting those expectations. Brown (2017) suggests teachers need clear examples of the types of instruction they are expected to provide. Mensah (2011) supports this argument by arguing "that for students to learn in the culturally relevant ways outlined by Ladson-Billings, teachers must learn similarly to teach in that manner". Professional development is how we create that manner.

Insufficient Science Instruction in Elementary School

Science is an essential component in early education as children develop an understanding of the natural world (Loach, 2021). However, when early education services fail to provide students with sufficient science instruction students develop deficits in the understanding of the natural world that impact their performance in the science curricula as they matriculate through secondary schooling. Wood and Lewthwaite (2008; as cited by Boutte et al., 2010) suggest, that the lack of translation of cultural aspects of science to the classroom may be partially due to the low priority placed on science in schools. With such a large push from the state of Georgia and federal acts such as NCLB, elementary teachers spend the vast majority of their instruction on teaching reading, writing, and mathematics. In a study conducted by Johnson (2011), in which the researcher sought to explore how teachers navigate change in pedagogy in culturally relevant science, Johnson deduced due to an increased focus on reading and mathematics at the elementary level there was an elimination of the teaching of science. As a result, the teachers in Johnson's (2011) study stated, that when students entered middle school their low reading and mathematical emphasized students lack of background knowledge in science. Shaver et al. (2007) corroborates Johnson's study by suggesting due to planned policies and inadvertent practices, the instructional time available for science is greatly limited in most

elementary schools. Moreover, academic success in culturally relevant science teaching includes a balance between developing what students may or may not have learned previously with grade-level expectations for student learning (Laughter & Adams, 2012).

Furthermore, the underrepresentation of Black and Brown students in science, technology, engineering, and mathematics (STEM) fields may be attributed to the lack of confidence in the skills required to "do" science. Maddock (1981; as cited in Aikenhead & Jegede, 1999) states, that a major influence on science education on students from developing countries is that science in school is like a foreign culture to them. If federal and state governments do not prioritize science within primary schools the lack of minorities in STEM fields will continue to grow. Where districts emphasize the acquisition of reading and math skills to ELL students as they enter the country, there should be the same emphasis on the development of science skills. Science is largely ignored in US federal efforts to improve elementary schools (Harvey et al., 2022) and as a result, the skills students need in secondary school to be successful are underdeveloped.

Summary of Scholarship

A large majority of the scholarship about culturally relevant pedagogy in science focuses on the knowledge, dispositions, and promotion of culturally relevant pedagogy in the science classroom. Though the literature on culturally relevant pedagogy dates back to the late 1980's early 1990's, there is very little literature on the implementation of culturally relevant pedagogy in the classroom. Despite, much of the literature in the early 2010 discussing the need for the pre-service teacher preparation programs to incorporate culturally relevant pedagogy in their coursework, authors in the late 2010s and early 2020s continued to write about the lack of CRP focus in programs across the United States. Moreover, Dr. Ladson-Billings and Geneva Gay's

theories of culturally relevant and culturally responsive pedagogy (respectively) are often misinterpreted and used interchangeably. As a result, the pillars of culturally relevant pedagogy are not implemented with fidelity and often one or two of them fall by the wayside of instruction. Furthermore, with a large portion of the literature suggesting teachers aren't receiving adequate professional development on the implementation of culturally relevant pedagogy in their science classrooms, these deficits in instructional practices about culturally relevant pedagogy will continue to increase if changes aren't made. Additionally, the literature suggests the lack of focus on science instruction in early years is contributing to the lack of skills students need to be successful in the science classroom.

Based on my review of the literature I believe that assessing the implementation of culturally relevant pedagogy in the science classroom will attempt to determine how school and district leaders could best support teachers with the application of culturally relevant practices in their classrooms. By providing teachers with a space to express their needs in their classrooms, this study will help with the creation of professional development sessions that apply to teachers and students in Title 1 science classrooms. As well as continue to advocate for culturally relevant pedagogy to become a required course in pre-service programs.

Chapter 3: Methodology

A study assessing the implementation of Culturally Responsive Pedagogy in Title 1 high school science classrooms was conducted via three qualitative methods consisting of self-evaluations, interviews, and a focus group session. This sought to understand how teachers are meeting the needs of the culturally and linguistically diverse student populations in Title 1 high schools. While determining what supports or additional resources may be needed to assist teachers with increasing their use of culturally relevant practices in the field of science. Moreover, through this study, we sought to identify weaknesses in instructional practices that may have contributed to the lack of proficiency on state standardized assessments.

Research Question

RQ: How are high school teachers in Title 1 schools effectively implementing culturally relevant practices in their science classrooms?

Research Design

For the purpose of this study, a qualitative collective (multi) case study was conducted to determine how the teachers in North Central, Georgia were implementing culturally relevant practices in their Title 1 classrooms. Creswell and Poth (2018), state in a collective (multi) case study approach the inquirer selects multiple case studies to illustrate an issue or concern. Qualitative inquiry is interpretive, experiential, situational, and personalistic research, that is subjective and relies on the perceptions of humans and their experiences to assess a problem by asking open-ended questions such as when, where, and how (Stake, 2010). Qualitative research explains a phenomenon through observational data from the lens of those who have experienced it. Through qualitative research, the researcher develops an intimate relationship with research participants in investigating the problem. As a result of qualitative research, the researcher can

identify underlying trends and themes for future research. For instance, with the topic of culturally relevant pedagogy being such a largely discussed topic within the educational community, the best way to effectively assess teachers' experiences and perceptions of the use of culturally relevant pedagogy is to do so through the use of qualitative inquiry/research. Additionally, to best understand the past experiences and cultural practices of students and implement best practices for culturally relevant pedagogy, teachers must build relationships through one-on-one conversations, class discussions, or observations.

Klem et al. (2021), state "qualitative research helps to understand, analyze, and interpret meaning perspectives, and experiences, by focusing on the 'how' and 'why' of a phenomenon." In this research study the researcher was seeking to understand and analyze how Title 1 teachers in North Central, Georgia are implementing culturally relevant pedagogy in their classrooms.

Teachers received a *Self-Audit of Your Culturally Relevant Classroom*. Teachers were asked to complete the self-audit evaluation with complete honesty. The twenty-question audit allowed for the assessment of participants' use of culturally relevant practices in their classrooms. The audit was also used to identify which pillars of culturally relevant pedagogy teachers are weak in and may need support. From there, the audit results were coded for trends, and interview questions were developed based on participants' responses. These questions sought to expand on the result of the audit and delve into understanding the underlying misconceptions, perceptions, and weaknesses in teacher instruction about culturally relevant pedagogy. Mertler (2019) states, "Often, researchers using qualitative methods do not state research questions at the beginning of the study, but they wait to collect data to have a better sense of what they're looking for". By having teachers complete the initial surveys, the

researcher will have a better understanding of the perceptions and usage of culturally relevant pedagogy in their classroom.

Participants were then asked to participate in a nine-question interview session for approximately 30 minutes. Once the interviews were completed, the interviews were transcribed, and participants' answers were then again coded to identify trends. Once trends had been identified from the interview questions, focus group session questions were developed to expound on how teachers were trained on culturally relevant pedagogy and to better understand what teachers needed to implement more effective culturally relevant pedagogy practices in their classrooms. A post was made to recruit between four and ten science teachers from Title 1 schools in North Central, Georgia. However, a response was received from six teachers who agreed to participate in the study. A Special Education science teacher was asked to be the note-taker for the focus group session. Upon the conclusion of the focus group session, the session was transcribed and coded to analyze and identify trends.

Research Site

The study was conducted to assess the implementation of culturally relevant practices in North Central, Georgia Title 1 schools. According to the United States Census Bureau, in 2022 the state of Georgia had a population of over 10 million residents. Of the over 10 million residents that live in the state, 33.1% are African American, 10.5% are Hispanic, and 2.4% are two or more races. Also, 12.7% of Georgia's are living in poverty according to the United States Census Bureau website. Additionally, the state is ranked seventeen in the nation for achievement in grades Kindergarten through twelfth (georgia.org), with a graduation rate of 84.1% (gadoe.org). Moreover, the Georgia Department of Education website states, that of eighth-grade students who took the EOG Science Milestone assessment in the 2022–2023 school year only

26% were proficient or above (gadoe.gov). Furthermore, the site also states, that only 40% of high school students that took the Biology EOC Milestone Assessment were proficient or higher. With more than half of the state's population receiving free or reduced lunch (59.3%) and being of African American or Hispanic descent (57%) (gadoe.gov), there is an obvious need for the use of culturally relevant practices in science classrooms across the state.

Participant Selection

This study sought to have a diverse group of participants. All participants are science teachers in Title l schools in North Central, Georgia. The teachers that were selected for this study came from different backgrounds and took different journeys into the education field. To obtain participants, a post was made on a social media platform recruiting teachers from schools in the North Central, Georgia area. To participate in the study participants had to meet the following criteria: must teach in a Title 1 school, must teach science, and must teach in a high school in North Central, Georgia (see Appendix A). An email and phone number were provided for teachers to contact the researcher if they were interested in participating. A total of 12 teachers responded to the post agreeing to their participation in the study. Ten of the twelve teachers met the criteria and were thanked for agreeing to participate in the study. Of the ten teachers who met the criteria, four were selected to participate in the Self-Audit evaluation and interview portion of the study. In the selection of these four participants, the researcher sought to select participants that varied in age, race, gender, and experience in education. Those four teachers were provided the Self-Audit evaluations to help inform the interview questions. The remaining respondents were asked to participate in the focus group study. These participants also provided the study with diverse viewpoints as they ranged in age, college experiences, routes to education, and science disciplines. Upon being informed about their selection to participate in

the study, all participants received a consent form (Appendix B) to sign indicating their will to volunteer in the study.

Data Collection

Multiple forms of data collection were used for this study: a Self-audit evaluation (Appendix C), an interview (Appendix D), and a focus group (Appendix E). To maximize the teacher's voice, ensure confirmability, and establish a level of trustworthiness a triangulation method was used to obtain data (Mertler, 2019). All participants were made aware of the purpose of the study in the recruitment of their participation. Additionally, all personal identifiers were removed: the participants were only referred to by pseudonyms. Consent forms containing the participants' actual identities and the list of pseudonyms were kept in a file on the password-protected laptop and separated from the list of participants' actual names. All 1:1 interviews were conducted in a neutral space that provided a suitable environment with appropriate visibility and quietness for the protection and comfort of both the researcher and the participants. These interviews were then recorded. The focus group was conducted online to accommodate the schedule of all participants.

Self-Audit Evaluation

The four participants were selected to participate in the evaluation and interview Self-Audit evaluation (Shade et al., 1997) for an initial assessment of teacher's perceptions and implementation of culturally relevant pedagogy in their classrooms. Upon the completion of the Self-Audit evaluation participants' responses were desegregated and coded for trends. The evaluation data was used to inform and develop interview questions.

Interviews

Interviews were conducted over three days. Each participant was interviewed in person individually in a roughly 30-minute session. The participants were asked nine questions about the implementation of culturally relevant pedagogical practices in their classrooms. The interviews were recorded with a video camera and notes were recorded in a field notebook. Through an interview study data was collected that directly reflects the views and perspectives of the interviewees through a topical interviewing approach. In selecting an interview study methodology, the researcher could hear directly from the teachers and obtain their truth on the culturally relevant practices in their classrooms.

Focus Group Session

The 45-minute focus group session was hosted via the Teams platform. Participants were asked a series of six questions; participants were also asked to keep all responses to three minutes maximum and respect others in the focus group session by using the hand-raising tool to add information and ask questions. The session was transcribed through the Teams platform and coded using Maxqda.

Reliability and Validity

Threats to the validity of the study included: the lack of honesty of teacher participants on surveys and interviews, the potential that the views of the focus group participants do not align with the goals of the study, lack of diversity in focus group sessions, the lack of prior contributions to research on the problem of practice. These threats were addressed in three ways. The first threat was addressed by creating a script for interview questions and encouraging teachers to be completely honest. The second threat was addressed by using technology to code for trends and developing focus group questions that align with the identified interview trends.

Additionally, the researcher was intentional in leading the session by setting clear parameters and redirecting the session if the conversation got off-topic. Threat three was addressed by consulting with other researchers of similar practices to find the most relevant documents and documents that aligned with the topic of culturally relevant pedagogy on a board scale to support/inform the study.

Data Analysis

The researcher analyzed evaluation responses manually. Responses were desegrated and coded for trends by identifying areas within each pillar participants felt they had mastered or progressed. The open-ended responses from the individual interviews and focus group discussions were analyzed with a qualitative data analysis computer software Maxqda. In addition to Maxqda, the researcher utilized the recording and transcription feature on Microsoft Teams and a field notebook to review and analyze the videos of the recorded sessions during the coding process. Additional areas of focus during the coding process included body language, voice tone, and statements made attributing to the recognition of themes. The developing themes identified from the data were grouped into categories. Conclusions were developed based on the findings of the research.

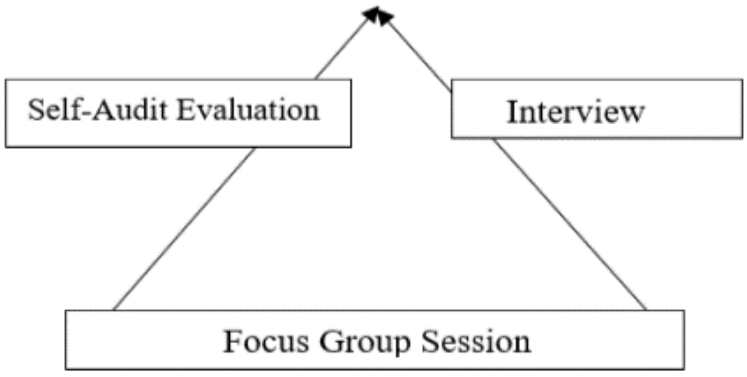
Trustworthiness

Considerations were made to dependability to address reliability, confirmability to address objectivity, and credibility to address internal validity to ensure the trustworthiness of this study by carrying out several procedures. For example, dependability of trustworthiness was ensured through the use of a journal that was maintained by the researcher throughout the study. The journal was maintained to assist with noting the precise data collection and analysis methods during research. The use of confirmability is a small, circumscribed intent within qualitative

research (Stahl & King, 2020). Confirmability of this study was sought by having other educational researchers evaluate and revise the study. Additionally, the data was triangulated from the self-audit evaluations, from the interview, and from the focus group to corroborate evidence. Stahl and King (2020) state, that the use of more than one method of collecting or analyzing data is methodological triangulation; methodological triangulation is one method of promoting credibility. The data from the Self-Audit evaluation, interviews, and focus group responses were collected and triangulated to confirm research findings. The results of the three methods were compared to identify similarities and differences in the pattern of themes that consistently emerged across the data sources. In addition, comparing the data from different data collection instruments provided a comprehensive understanding and implementation of the participants' culturally relevant pedagogy. The triangulation of the data from these varied sources improved the quality and validity of the research outcomes, maximized the impact of teacher perspectives, and ensured confirmability and accuracy, to add levels of trustworthiness for this study.

Figure 2

Data Collection Methods Used in Triangulation



Limitations

Limitations to this study include sample size, the Hawthorne Effect, and bias. Due to the small number of respondents willing to participate in the study and an even smaller number of participants that met the criteria, the researcher was left with a small sample size limiting various teacher perceptions. Having the ability to interview a greater number of Title 1 scientists would have given the researcher a greater scope of understanding teachers' perspectives and implementation of culturally relevant pedagogy in their classrooms. The second limitation of the study was the Hawthorne Effect. According to the Harvard Business School website (https://www.library.hbs.edu), The Hawthorne Effect is a term coined from a study conducted by Harvard University, in which they found participants' behaviors changed as a response to being observed. Given the researcher's role as a department chair and a fellow science teacher, participants may have altered their responses/behaviors to appear they know, implement, or

understand more about culturally relevant pedagogy in fear of seeming ignorant. The researcher's role as a science teacher may have also impacted participants' honesty and their willingness to be candid about the needs of their classrooms. To encourage participants to be as honest as possible, the participants were made aware in both consent forms and introductions that the information collected via their participation in this study would help to further science education research and intended to assist with the development of effective resources for teachers. The final limitation of this study is researcher bias. Again, as a fellow science teacher, the researcher was aware of the lack of resources and support provided to teachers about culturally relevant pedagogy in the science classroom. Being biased and having experienced the impacts of not having the support/resources needed to effectively implement culturally relevant pedagogy in their classroom may have impacted the perspective in which the study was written, and the development of interview and focus group questions.

Ethical Considerations

Before conducting the study, the researcher completed the mandated Collaborative Instructional Training Initiative (CITI). The researcher also obtained Instructional Review Board (IRB) approval from Kennesaw State University before conducting the study, to ensure an ethical study. However, a possible ethical issue that posed a risk to the study is the school selection of choice. It was intended for this study to be conducted at Title 1 schools given the economic demographics and initial implications of the study. Conducting the study at Title 1 schools in a predominately black and brown community the study risked being viewed as biased and posing a threat to the small amounts of positive attention the school receives. Yet, the benefits of the study will address deficits in instruction that may be contributing to the low performance of students in the state of Georgia. The following steps were taken to ensure the

ethicality of this investigation: Throughout the study the researcher protected the identities of all participants involved in the process through the use of pseudonyms, to create a product that is representative of the participants and their views, through the creation protocols and structures to guide the interviews and focus groups. As well as to ensure both were productive and the information was collected with efficacy, as a researcher was not biased when selecting research participants, conducting research, or reporting research findings, the researcher also obtained consent for participation from the district as well as the participants and reviewed and reference previous research conducted on the topic such as books and peer-reviewed articles to support the study. Additionally, participants were kept abreast of changes and progress made as the study developed. This was done to avoid the misinterpretation and misquoting of participants' responses as well as making biased analyses of trends in the study.

Positionality

As a teacher who began their career as a middle school educator, I was required to engage students in a plethora of ways. Quite often I was observed by school administration to ensure I was providing differentiated instruction, culturally responsive pedagogical practices, and meeting the needs of the diverse population of students I taught. As a middle school teacher, we attended professional development sessions each Wednesday, which equipped us with new research-based instructional strategies that were targeted towards the academic and emotional needs of the primarily African Americans and Hispanics in a Title 1 school population in which I was expected to demonstrate my knowledge of these new and engaging instructional strategies. Moreover, we were required each week to meet with our Professional Learning Communities (PLCs) to discuss the efficacy of our instructional practices based on weekly common assessment data. These PLC meetings consisted of subject area administrators, PLC leads, and

all teachers who taught science. The conversations were intentional about the needs of the students we taught and always ended with the question, “How will we remediate, accelerate, or enrich the students based on their assessment data?” This critical question often resulted in flexible grouping of students with similar learning needs, new instructional practices, and most importantly us as teachers reflecting on what pedagogically worked or did not work. These practices strengthened my pedagogical knowledge and forced me to create lessons that were culturally and academically responsive to the students at my school. As a result, student engagement in my class was high, students desired to be in my class, and student achievement increased on state standardized testing.

As my career progressed, I transitioned from a middle school teacher to a high school teacher. In this new role, there were blatant differences in the school’s climate and culture as students were given more freedom and responsibility due to expectant maturity. Some of these differences include, not walking students to and from lunch or connections, not receiving weekly professional development, and the lack of parent involvement in student academics. However, the most significant difference I observed was the lack of diverse instructional strategies and practices to meet the academic and emotional learning needs of high school students. Though the high school that I transitioned to serves the same demographic of students as the middle school in which I previously taught, the teachers at the high school did not have the same instructional or professional practices that were used in the middle school to support student learning. As a result, student achievement on state standardized assessments suffers.

My entire teaching career has been in the same district with essentially the same demographic of students. My transition to high school consisted of me moving to the feeder high school of the middle school in which I began teaching. The schools are located in one of the

largest most affluent districts, in suburban Georgia, and have a diverse population of students mostly African American, Hispanic, and Caucasian students. Additionally, a large number of the students at the school receive free or reduced lunch. With such a diverse population of students both culturally and financially teachers must have access to an assorted repertoire of instructional strategies and practices to meet students where they are academically.

When I started my venture as a high school teacher, I met many other teachers in the science department whose journey to education was similar to mine. Many begin as biologists, Chemists, physicists, and even as an epidemiologist for public health institutions. As did I, we all transitioned from careers as scientists to careers as educators, all agreeing our current field is more gratifying and rewarding. Though we shared similar paths into education our teacher preparation programs and experiences once we entered the education differed. I was one of two out of an entire department of sixteen teachers who had experience teaching at a level other than high school. Moreover, many of the other teachers obtained certification through the GaTAPP program or received a Master of Art in Teaching and stopped the education in education at the certification level. Few others pursued Specialist degrees in areas such as Education Leadership, Curriculum and Instruction, or Instructional Technology. However, despite their educational training, I have observed many of them revert to traditional teaching practices such as lecturing, notetaking, and worksheets. In a weekly PLC meeting, which we are required to have with teachers who teach the same discipline of science as we do, we were having a conversation about the Ecology unit assessment data. The teachers in the PLC expressed their discontent with their student's performance on the assessment. They discussed the rigor of the assessment and its importance being that Ecology represents a large part of the state's Milestone Assessment in the class. As the meeting concluded they discussed the instructional strategies to teach the content.

As they shared the strategies they used as guided notes, Frayer models, and technology resources, I remember a teacher stating, “She did not have her students complete hands-on activities because the students did not understand the content”. As a teacher that transitioned from middle school this statement completely surprised me. I began to ask myself, why would these students want to learn the content if all they are expected to do is take notes and complete worksheets? How are these teachers making the content relevant to their students? How are the teachers creating lessons that are engaging yet challenging? As I continued to attend the weekly PLC meetings, the conversation about instructional strategies used to teach each unit did not change much. It became evident to me, that despite the vast science content knowledge these teachers have, their ability to implement strategies to meet the needs of the academic and culturally diverse students was minimal. This is not to say, these teachers are not effective or good at their jobs but there is a need for these teachers to increase their pedagogical practices by implementing culturally relevant instructional strategies.

Chapter 4: Findings

The purpose of this chapter is to present the findings of this qualitative multi-case study conducted to assess 1. What teachers know about culturally relevant pedagogy 2. How are teachers implementing the pillars of culturally relevant pedagogy in their classrooms? 3. What barriers are impeding them from becoming more culturally relevant educators? 4. What resources/supports do they need to move their instruction to a more culturally relevant approach? This chapter includes a description of the participants' demographics and their backgrounds in science and education. Followed by a results section that summarizes the findings of the Self-Audit evaluation data, reviews participant interview responses; and provides a summary of the focus group session. The section concludes with a review of the four major themes that emerged in the study along with a summary of its findings.

The following questions guided this study:

RQ: How are high school teachers in a Title 1 school effectively implementing culturally relevant practices in their science classrooms?

Description of Participants

Demographics of Participants

The nine participants selected for this study responded to a social media post soliciting the help of Title 1 science teachers at schools in suburban North Central Georgia. Four of the nine participants were asked to participate in the evaluation and interview portions of the study to give a based-on difference in their demographics and backgrounds in education. The five remaining participants selected also met the criteria for the study as outlined in Chapter 3. Demographic and background data was obtained during the interview and focus group sessions of the study. Table 1 displays the demographical and background data for the interview and

focus group participants. Pseudonyms to protect the identity of participants are used in Table 1 and from this point forward.

Table 3

Study Participant Demographics

Participants (pseudonym)	Gender	Race/Ethnicity	Years in education	Science discipline	Teacher prep program
Paige	Female	African American	< 1	Physics/ Biology	STEM teacher fellowship
Ansley	Female	Caucasian	7	Honors Bio/ APES	Post Baccalaureate program
Alejandro	Male	Hispanic	6	AP Chem/ Physics	Metra RESA
Timothy	Male	African American	2	Physics	Undergraduate program
Paul	Male	African American	11	All sciences	GaTAPP
Brandon	Male	African American	6	Special Education Biology	GaTAPP
Francis	Female	African American	2	Zoology	Undergraduate program as a minor
Hudson	Male	African American	28	Physics	MAT program
Heather	Female	African American	17	Forensics/ Human A&P	Med program

Participants Background

Paige's Background. Paige is a 25-year-old African American female teacher. She is in her first-year teaching and has recently graduated from a Historically Black College where she majored in Biology. She initially wanted to pursue a Upon graduation she was recruited to join a prestigious STEM teacher fellowship where she received her master's in education and teacher

certification. Paige comes from a family of educators, that encouraged her to become an educator as well. During this study, Paige taught chemistry and biology.

Ansley's Background. Participant Two is a 35-year-old Caucasian female. She is entering her seventh year of teaching. Previously, she was taught in a rural low-income school in North Georgia. She also serves as an adjunct professor at the collegiate level. Education was also a second career choice for her as she studied Marine Biology and Ecology. She entered the teaching field as a way to pay for school and ended up enjoying the career. Ansley took an alternative route to obtain her credentials and received her certification through a post-baccalaureate program. During this study, she taught Honors Biology and AP Environmental Science.

Alejandro's Background. Alejandro is a 39-year-old Hispanic male teacher. He has been teaching for six years. Education is his second career choice. His former career was in public health in which he worked for a large government agency. He will be referred to as Alejandro and will be teaching Advanced Chemistry and Physics courses. Alejandro landed in education after seeking employment in the science field to be closer to home and to be closer to family Initially he planned for his stint in education to be short but developed a passion for high school students. He obtained his teaching certification through Metro RESA an alternative certification program. He began the alternative certification program in a different state and finished the program in Georgia. Throughout this study, Timothy taught physics.

Timothy's Background. Timothy was the last participant to be selected to participate in the evaluation and interview portions of the study. Timothy is a 30–year-old African American male. He is in his third year in education, but his second year as a contracted district employee. He has a bachelor's degree in teaching with a concentration in Biology. Timothy attended a

predominately white institution in another Southern state. After graduation, he pursued other avenues and careers before being asked to fill in as a long-term substitute teacher at a Title 1 school. Upon the completion of his assignment, he was hired on to teach Physics and has been at his current school since then. Timothy is a third-generation educator. His grandmother was an educator in Alabama, while his father was also an educator in Georgia who held leadership roles. Observing their contributions and love for education inspired him to follow in their footsteps.

Results

Evaluations

The four teachers selected to participate in the first portion of this study were asked to complete an evaluation to assist the researcher with getting an initial understanding of how teachers felt about their implementation of culturally relevant pedagogy in their science classrooms. The Self-Audit of Your Culturally Relevant Classroom (Shade et al., 1997) was edited for teachers to evaluate how they were implementing culturally relevant pedagogy in their classroom environment, student interactions, and instruction.

The classroom environment was the first area of the classroom participants were asked to evaluate. The questions in this section questioned the teacher's climate and culture of their classroom by asking about the participant's daily routines, sense of family and community, the incorporation of various learning styles, as well as visual representation of the cultural groups in the teacher's classrooms. All teachers stated they were implementing strategies that appeal to various learning styles and have classroom routines in place in their classrooms that support student learning. However, some participants were progressing in creating a family and community within their classroom, while ensuring there were visual representations of the cultures of the students they taught.

Next, teachers evaluated their interactions with the students in classrooms. This evaluation section assessed how teachers were promoting the culturally relevant pedagogy pillar of academic success. To assess this pillar, teachers were asked about their awareness of students' cultural and learning needs, the collaboration of student work in their classrooms, the ability of students to acquire support if desired, and the expectations for high academic achievement. Based on the evaluation responses, the teachers were aware of the different learning needs of their students, they all promoted high academic success in their classrooms, and their students were able to receive support when needed. Yet, some struggled with creating a classroom that promoted collaboration and flexible groups that ensured students worked with various partners.

In the last section of the evaluation, teachers assessed their instruction. The pillars of critical consciousness and cultural competence were evaluated. To evaluate these pillars teachers were asked about their instruction style (presenter or facilitator), the incorporation of concepts to meet the needs of diverse learners in terms of learning style and culture, and the incorporation of current issues that are relevant to the students in their instruction. Overall, teachers created lessons that were diverse in their delivery. Teachers stated they incorporated the use of music and current topics to engage students in their lessons. The teachers also stated they provide multiple ways for students to demonstrate their knowledge and reflect on students learning abilities. However, the teachers struggled to create classrooms that were student-led/focused and teachers served as facilitators instead of presenters.

Paige's Interview

Paige is a novice teacher who is navigating her way through her first semester as a new teacher. However, Paige does have some insight into culturally relevant pedagogy through her teacher preparation program. Paige stated her program had a class designated to culturally

relevant pedagogy and effectively taught students of various cultures. When asked what culturally relevant pedagogy means to her, she stated “It means knowing the many layers to the culture of a student, not just their race but also the music and games they like to play.” Paige is implementing culturally relevant practices in her classroom in various ways. She said her classroom was decorated with a gaming theme to appeal to the students she taught in hopes of engaging them when they entered the classroom each day. Paige also stated she gave her students a survey at the beginning of the semester to learn about their music preferences, learning styles, and interests. She uses these surveys to determine the music she plays during class, what assignments she’ll give students, and what instructional practices she’ll use to deliver instruction. In addition, she ensures her students follow a daily routine as she believes that part of a person relates to their routine.

When inquired about the foundational pillars of Culturally Relevant Pedagogy, Paige articulated her commitment to fostering critical consciousness in her classroom. She achieves this objective by meticulously integrating instructional materials that resonate with her students’ experiences, thereby cultivating a learning environment that is authentically and culturally relevant. She illustrated the concept of cellular respiration by offering a tangible example from the realm of sports, expounding on how athletes utilize cellular respiration during their physical activities. Moreover, for students in her class who were not necessarily athletes, she connected the concept to their daily experiences, such as brisk walking to class, highlighting how even simple activities could lead to breathlessness, in doing so bridging the gap between theoretical knowledge and real-life applications.

When questioned about instructional strategies aligned with the pillar of Academic Success, she articulated her approach by highlighting the demanding and rigorous nature of the

courses she teaches. Emphasizing the need for high levels of expectations, she underscored the challenging academic environment she cultivates to propel students toward achieving scholarly excellence. In delineating the rigor of her high school Chemistry and Biology courses, she highlighted her rigorous academic expectations. She emphasized the necessity for students to devote substantial time, allocating twenty to thirty minutes every night to independent study. Furthermore, she implements a rigorous assessment system, administering weekly formative assessments designed to gauge students' mastery of the skills aligned with the state's standards. This structured approach aims to ensure a comprehensive understanding of the subject matter and fosters a culture of high academic success within her classroom.

Despite Paige's profound understanding and application of practices rooted in culturally relevant pedagogy, she acknowledged some barriers hinder her effectiveness as a culturally relevant educator. Among these barriers, she highlighted the substantial impediments due to large class sizes, insufficient time to get to know all her students, and the struggle to balance the demands of the career, particularly as a first-year teacher. Paige also conveyed her need for additional resources to effectively support the ELL population in her classroom. These obstacles significantly limited her ability to incorporate more culturally relevant approaches into her classroom and instructional practices, highlighting the complex multifaceted nature of implementing culturally relevant teaching practices.

Ansley's Interview

Ansley isn't new to the field of teaching nor to the idea of teaching students from lower socioeconomic groups. As a teacher who has taught in a North Georgia rural area with less affluent students, Ansley is aware of going the extra mile to meet her students where they are and appeal to their academic needs through a culturally relevant approach. Ansley's definition of

culturally relevant pedagogy stresses the importance of building meaningful relationships with her students and tailoring classroom examples and lessons to directly connect with their lived experiences and cultural backgrounds. In doing so, she emphasizes the importance of establishing rapport and incorporating content that resonates with her students.

Ansley effectively implements culturally relevant pedagogy in her classroom in many ways. She empowers her students by allowing them the freedom to express themselves in their academic work, promoting a sense of individuality and cultural identity within student learning. Additionally, Ansley creates a safe and open environment where students feel comfortable sharing their needs and emotions, ensuring their voices are heard and respected. Furthermore, Ansley adapts her lessons to align with her students' interests, making the content more engaging and relatable. She also demonstrates a commitment to equity by providing access to essential resources, despite the financial constraints faced by some of her students.

Ansley's formal training in culturally relevant pedagogy during her preservice program equipped her with the knowledge and skills necessary to create lessons that effectively address the culturally relevant pedagogy pillars, particularly the pillar of academic success. She translates this knowledge into practice by instilling high expectations for academic achievement in her classroom to meet the demands of the rigorous curriculum that challenges her students to work diligently for their success. In recognizing the struggles faced by her students, Ansley adopts a supportive and empathetic approach. She encourages her students to persevere through their challenges, providing them with the necessary support and guidance to comprehend the content. Ansley creates a nurturing learning environment where students feel comfortable asking questions without fear of consequences.

Ansley has concerns about implementing the pillar of critical consciousness in her classroom that reflects the complex challenges educators often face when addressing issues related to diversity and inclusion. As a Caucasian woman teaching minority students in a context marked by societal tensions, she has apprehensions about being reprimanded by her district for being too transparent and honest. Moreover, the constraints posed by high-stakes testing the demand for data-driven instruction, and the pressure to meet standardized testing requirements that often consume valuable instructional time, significantly impede her efforts to become a more effective culturally relevant teacher.

Alejandro's Interview

Alejandro stated he had not received and formal education on the theory of culturally relevant pedagogy and was unsure of what the meaning and application of the theory was in education. He stated he could deduce from the name of the theory it meant making the content relevant to students. When asked how he was implementing practices to relate to his students, Alejandro starts by putting himself in his students' shoes and crafting lessons that appeal to their viewpoints.

When questioned about his implementation of the pillar of critical consciousness in his classroom, Alejandro articulated his approach by linking new topics to students' interests, specifically by relating the subject matter to potential careers that align with the topic at hand. In doing so, he integrates real-world applications and connects the curriculum to students' future aspirations. He provided an example of the fireproof tables in the classroom and how a material chemist was needed to design the table. He stated he begins each lesson with a phenomenon relative to his students. In addition to his efforts to relate classroom topics to students' interests and potential careers, Alejandro further reinforces the pillar of critical consciousness by

incorporating diverse examples of jobs where the disciplines of chemistry or physics can be applied by showcasing the practical applications of the subjects beyond the classroom.

Moreover, Alejandro stated his approach to promoting academic success in his classroom emphasized through the implementation of high standards and rigorous instruction. He does so by deliberately designing challenging lessons that exceed the basic curriculum requirements, pushing his students beyond their comfort zones, and setting the bar higher than the standard framework demands. He stated, that by teaching Gifted/Accelerated students, he can push them to further in their knowledge, knowing they will respond to the challenge. In contrast, he has learned he cannot have the same expectations for students who are on level because they retreat from the challenge and do not respond in the way that he anticipated. This has allowed him to adjust his teaching to the students his teaching at the time.

Alejandro stated he has challenges in finding ways to engage his students despite his efforts to make the content relative to them. Stated, “It is difficult to teach in ways that are effective since my classroom consists of so many different cultures and individuals that I don’t have time to get to know.”

Timothy’s Interview

Timothy expressed his perspective on the meaning of culturally relevant pedagogy, by emphasizing the inclusivity of his teaching approach. To him, culturally relevant pedagogy means embracing and incorporating all the diverse cultures present within his classroom without exclusion. By valuing the cultural backgrounds of his students, he fosters an inclusive learning environment where every student’s cultural identity is respected and integrated into classroom instruction. In contrast to Paige and Ansley, Timothy’s teacher preparation program did not equip him with the necessary training in implementing culturally relevant pedagogy in his

classroom. Despite this deficiency in formal preparation, Timothy demonstrates initiative and resourcefulness by independently finding ways to integrate culturally relevant practices into his teaching. Timothy employs multifaceted approaches to integrate culturally relevant practices into his classroom, despite the absence of formal training. At the beginning of each semester, he fosters a sense of belonging and understanding among his students by engaging them in icebreaker activities aimed at exploring their diverse cultures. Subsequently, he invests time and effort in strategically planning ways to infuse cultural elements within his instruction. This strategic integration manifests in various forms, such as crafting test questions that resonate with the students' cultural backgrounds, incorporating diverse foods as instructional tools, and designing projects that empower students to authentically represent themselves and their cultures in their academic work.

When inquired about the pillar of critical consciousness, Timothy emphasized the significance of fostering students' awareness regarding societal inequalities, particularly related to the representation of diverse student backgrounds within his classroom. He goes a step further by encouraging his students to actively engage with and critically examine various perspectives from different cultures. By urging his students to explore these diverse viewpoints, he empowers them to apply this understanding to the academic content and nurture a sense of critical consciousness. Furthermore, Timothy actively incorporates the pillar of academic success by setting clear expectations for his students and providing them with explicit guidance on what is expected of them academically. He goes beyond instruction by fostering a culture of encouragement by motivating his students to strive for excellence and promoting them to continuously improve. Additionally, he consistently promotes and supports his students' efforts

to reach their full potential. He believes in the power of education and is dedicated to teaching students the essential knowledge and skills they need to succeed.

Timothy acknowledged that he believes an increase in space and resources would enhance his ability to become a more culturally relevant instructor. He admitted to facing challenges in engaging with students who are not part of the minority, indicating a need for additional support. He expressed a willingness to seek guidance from a mentor as a resource to assist him in creating culturally relevant practices that resonate with all students in his classroom, regardless of their cultural background. Additionally, he disclosed that his only formal training on culturally relevant pedagogy was received through a cultural sensitivity program designed to promote positive behavior reinforcement.

Table 4

Practices Implemented in Participants' Classrooms

Culturally relevant pedagogy pillars	Examples of implementation in participants classrooms
Expectations of high academic success	Increasing the rigor of the standard Creating a student-centered classroom Encouraging students to struggle through their learning Weekly assessments
Critical consciousness	Applying content to a career Creating a classroom appealing to student interest Using phenomenon to drive lessons
Cultural competence	Playing music during instruction Icebreaker activities Incorporating cultures in projects, assessment questions, and classroom discussions

The Focus Group

The focus group session consisted of six teachers. The demographics for each teacher can be located in Table 1. All six of the teachers who participated in the focus group session were African American two of which were women and the other four were men. The teachers provided a diverse range of experience from two years to twenty-eight years of teaching experience. They also taught various science classes including, Zoology, Forensics, and Physics, one Special Education teacher, and one credit recovery science teacher who teaches all science disciplines offered at his school to students who previously failed science courses. Moreover, the teachers obtained their teaching certification credentials through various programs. These programs include: The Georgia Teacher Academy for Preparation and Pedagogy also known as the GaTAPP program, a Master of Art in Teaching program, and two undergraduate programs. Four of the participants attended Historically Black Colleges (HBCU) and two of them attended Predominantly White Institutions (PWI).

I began the focus group session by asking the participants, what comes to mind when they think about culturally relevant pedagogy and how they're implementing culturally relevant practices in their classrooms. Heather a seventeen-year veteran stated that when she thinks about culturally relevant pedagogy, she thinks about using students' background knowledge to get them to understand what they're learning about at the time and making that content relevant to their everyday lives. Francis, a teacher in her second year of teaching Zoology stated culturally relevant pedagogy to her "means bridging the gap because she often finds students that are unable to connect to the content she is discussing in her classroom". She emphasizes the frequency of this in science as her students lack experience and have language gaps. "So, culturally relevant pedagogy is finding ways in which I can merge it for them to understand and

feel like they're included and not left out because of a cultural difference" Francis stated. Heather explained she makes her lessons relevant to students' interests and provided an example of how she plans to integrate the student's interest in cannabis and the concept of photosynthesis to encourage students to be engaged. While Francis stated she is intentional in making sure her lessons are inclusive of all the cultures in her classroom.

The participants who held bachelor's degrees in science fields such as Heather, Paul, Hudson, and Francis were asked, as educators who earned bachelor's degrees in science fields and became educators as a second career or career choice, how do you feel your content knowledge impacts your ability to be a CR teacher? Francis stated that her strong content knowledge allowed for her to modify instruction and make adjustments on the spot. She continued by stating her confidence in the content knowledge makes it easier for her to make connections between her students and the subject matter and allows her more time to adjust for her kids versus having to reteach herself the content. Hudson a twenty-eight-year veteran in education stated, that having a better understanding of the content also helps him to adjust on the fly like Francis. In contrast, Paul a teacher in his eleventh year of education stated, "I wouldn't say that my degree helps me with the kids as much as the school I attended, helps me more, meaning that by being in an HBCU environment there were a lot of different cultures and diversity in the way things were handled for example financial aid". Paul's experience at an HBCU prepared him to be able to adjust and be able to manipulate things based on his surroundings. Paul went on to state, that his experience at an HBCU was family-based and created a tight-knit community in which people weren't judged for their differences in culture, skin color, or who they were. Paul felt his college experience made him able to be more sympathetic to students and possess compassion in understanding the student's environment and

getting to know their mental and physical needs before providing instruction. Heather concurred with Paul by reiterating the importance of building relationships with students and connecting with them on their own level. She stated, “Once you get to know them and connect with them, you can teach them anything”. She provided an example in her teaching of polymerase chain reactions, she gave her students a beat and required them to write a song about the breakdown of polymerase chain reactions. She attributed her ability to implement this assignment to her being in tune with her students, giving her the ability to make connections with them. Timothy interjected, that being an alum of a PWI he felt his experience at his intuition did not provide him the same privilege as the HBCU graduates did. As a result, he was forced to forge relationships with people to obtain the knowledge and resources he needed. Furthermore, this allowed him to foster relationships in his classroom with students who were resistant to being engaged forcing him to be an out-of-the-box thinker; in finding a roundabout way to get to the center of the problem with his students.

All teachers were then asked about the barriers they faced that were impeding them from being more effective culturally relevant teachers and if they had received any resources or training to address those barriers. All the participants apart from Hudson stated, that they had not or could not recall at any time in their career that they’d received any professional development or resources on implementing culturally relevant pedagogy in their classrooms. Hudson highlighted his experience in the historical context and expectations surrounding Culturally Relevant Pedagogy in the field of education. His account of the significant emphasis on culturally relevant pedagogy, when he entered the profession 28 years ago, emphasizes the importance placed on incorporating cultural representation in classrooms, lesson plans, and assignments with the requirement for teachers to showcase diversity and cultural awareness in

various aspects of their teaching, such as bulletin boards and assignments. Hudson states that culturally relevant pedagogy was instilled in him from the beginning. Heather said despite not being given resources or training on culturally relevant pedagogy, she would like to expose her students to the content they are discussing in class by going to labs and providing them with real-world situations regularly. She felt that having more resources would allow the students to not only make connections but also observe them in the application. Moreover, all participants stated one of the barriers they faced in providing more effective culturally relevant instruction was the fear of being scolded or receiving punitive consequences. Paul said the red tape and fine lines of what teachers can and cannot talk about or the books or videos you want to show students. Paul continued by saying, that society has now made so many things controversial that it cuts teachers off from building relationships with students and builds a wall between student and teacher. Timothy corroborated Paul's statements by stating teachers are held to higher standards than other professions and face repercussions and societal backlash instead of being appreciated and looked at, as second parents to students. Brandon a seven-year special education teacher added "It's like walking on eggshells even when teachers are attempting to prepare students for the real world". Hudson argued that even when teachers know they are doing what is right, they must proceed with caution when providing students resources or instruction that could be deemed problematic or result in the removal of teachers from their jobs.

The final question participants of the focus group were asked was how their teacher preparation programs extend their knowledge of culturally relevant pedagogy. Did they feel their teacher prep program equipped them to be effective culturally relevant teachers in a Title 1 school? If so, how? If not, what did they feel was lacking? Except for Hudson and Francis, the

other participants stated their teacher preparation programs did not prepare them or equip them to be effective teachers in Title 1 schools.

As stated previously, when Hudson entered the field of teaching over 28 years ago, there was an increased focus on the implementation of culturally relevant pedagogy in classrooms across the country. Francis stated her teacher preparation program which she took in conjunction with her biology degree at an HBCU provided explicit instruction on how to incorporate lessons that address the needs of diverse students, based on culture and academic abilities. On the contrary, the other participants, two of whom received their certifications GaTAPP program stated, that they were not effectively trained on culturally, relevant pedagogical practices, nor were they trained on best practices for students in Title 1 schools, despite one of those participants being a special education teacher. Both stated they acquired their knowledge through their time in teaching Title 1 schools. Heather also stated she was not provided explicit instruction on how to best reach diverse cultures and students at a Title 1 school through her master's program in which she received her teaching credentials. She also stated she learned to become a culturally relevant instructor through practice and trial and error with the students she taught. Timothy, on the other hand, a graduate of a PWI with an undergraduate focus in education stated that though his program attempted to prepare him to teach in diverse settings, he ultimately felt as though he provided an example for his classmates and peers being he was the minority in his program. He stated he often found himself providing the perspective of the minority student to his classmates and professors for them to obtain the viewpoints of the minority populations. He said he felt as though they learned more from him being the minority than he did in the class intended to equip students with best practices to reach minority students.

Theme 1: Teachers Are Implementing Culturally Relevant Pedagogy Without Knowledge of the Three Pillars

The first theme that emerged in the study indicates that teachers are making efforts to implement culturally relevant practices in their classrooms. This implementation involves various strategies, such as incorporating music, developing lessons based on student interests, and establishing relationships through icebreakers and surveys. The findings suggest that, while the participants were incorporating certain aspects of culturally relevant practices, there were variations in the depth and alignment with the three pillars outlined by Ladson-Billings. The emphasis on rigor, academic success, and increased expectations varied among teachers, with some expressing a focus on meeting state standards rather than increasing the rigor or academic expectations beyond that required of the standards. Though the teachers were actively incorporating certain elements of culturally relevant practices, there are variations in their understanding and application of the three pillars impeding them being better culturally relevant teachers.

Theme 2: The Fear of Being Reprimanded

The fear of being reprimanded arose in both interviews and the focus group session. Ansley stated she feared her racial differences limited her ability to be more transparent with her students as her district and the state aimed to remove the discussion of diversity within the classroom. Although Ansley's approach to her students advocated racial equity and promoted unity, the current manner of society caused her to change her approach to developing relationships with her students. Subsequently, her fears translated to her instructional practices.

Participants in the focus group discussion also stated their fear of being reprimanded impeded their ability to be more culturally relevant in their classrooms. Heather stated she let a

young lady to the media center to get a book. When the young lady returned with the book she'd checked out, Heather made her return the book because of the controversy of the book within Heather's school district. Paul stated that he fears losing his job so he refuses to implement practices he knows would be effective including class discussions and relating the content to societal issues. "I have a family to feed; I can't lose my job because of something I've said to a kid". The other participants agreed with his statement and included the fear of being reprimanded makes it harder for them to effectively do their jobs.

The roles that teachers in Title I schools often assume, extend beyond traditional instructional responsibilities. Teachers in Title 1 settings frequently find themselves taking on additional roles, such as parental figures, cheerleaders, and counselors, to provide a more supportive learning environment conducive to their student's needs. Developing meaningful relationships with students often involves addressing their social and emotional well-being, and sometimes, these conversations are essential for fostering a positive relationship that encourages learning. Creating an atmosphere where teachers are fearful of consequences hinders their ability to engage in these critical conversations and build the essential relationships that contribute to student success. Efforts to understand, appreciate, and support teachers in these roles are crucial for fostering a positive school culture that prioritizes the well-being of students. This includes recognizing the importance of relationship-building and providing teachers with the autonomy and support needed to navigate the complexities of their roles in Title I schools.

Theme 3: Lack of Focus in Teacher Preparation Programs

In reviewing the literature about culturally relevant pedagogy and science, the recurrent theme of preservice programs inadequately preparing teachers to instruct culturally, and linguistically diverse students arose. The fact that only four out of the ten teachers in the study

had received formal training in their teacher preparation programs is indicative of a systemic issue that needs to be addressed at the foundational level of teacher education. Timothy's observation, where he felt his teacher preparation program attempted to prepare him but ultimately used him as an example, accentuates the need for more than just theoretical training. Preservice programs should provide practical, hands-on experiences that empower future teachers with the skills, knowledge, and cultural competence necessary to effectively teach diverse student populations.

Given the evolving demographics, it's imperative that teacher preparation programs proactively address the changing needs of society. This includes strategies for teaching students from diverse backgrounds, understanding cultural nuances, and adapting instructional methods to accommodate the various learning styles and language proficiencies of students. Reforms to teacher preparation should include ongoing evaluations and adjustments to ensure that programs are equipping educators with the tools they need to be effective in diverse classrooms. This involves incorporating culturally relevant pedagogy, diversity and inclusion training, and immersive experiences that allow preservice teachers to engage with diverse communities. Ultimately, there is a lack of preparation for teachers in the realities of today's classrooms, where diversity is the norm, and it is crucial to foster inclusive, equitable, and effective educational environments.

Theme 4: Insufficient Resources and Professional Development

The final theme that arose was the theme of insufficient resources and professional development. As stated previously in this manuscript, the state of Georgia expects teachers to create classroom environments that are culturally accepting and provide students with instruction that is academically relevant to each student. The revelation that teachers in the study had not

received any professional development on Culturally Relevant Pedagogy in their current schools is a significant concern, especially given the state's expectations for educators to create culturally accepting classroom environments and provide academically relevant instruction to each student. Brandon stated he acquired his knowledge and skills in teaching diverse students, despite being a special education teacher responsible for specialized instruction through trial and error. These experiences were shared by the other participants in the focus group, where they stated, "much of their learning about teaching diverse students occurred through practice and implementation in Title I schools" highlighting the importance of on-the-job learning. However, this should complement, not replace, systematic professional development that equips teachers with the foundational knowledge and strategies needed to address the diverse needs of their students effectively.

Additionally, teachers stated they did not have sufficient resources needed to provide their students with experiences or instructional resources needed to decrease deficits their students displayed and to create opportunities for their students to apply the learned science concepts. The statements from Francis, Heather, and Timothy highlight the dedication of teachers to enhance student learning experiences, even when faced with resource constraints. Francis stated she uses her funds to purchase items for lessons. Heather stated she desires to provide more culturally relevant teaching experiences through trips and additional opportunities aligned with the pillars of Culturally Relevant Pedagogy. That will create experiences to contribute to students' background knowledge and overall success in the classroom. However, the acknowledgment of constraints, such as financial limitations, points to the importance of increased support and resources for teachers to create these enriching experiences. Timothy suggested that providing him with more opportunities and space would enhance his effectiveness

as a culturally relevant teacher and those adequate resources and physical space were crucial for him implementing dynamic and interactive teaching methods that cater to the diverse needs of students.

Summary of Findings

After assessing the implementation of culturally relevant pedagogy in Title 1 Science classrooms with teachers in North Central, Georgia schools through evaluations, interviews, and a focus group session, three main themes arose from the study regarding teachers fears of being reprimanded, the lack of emphasis placed on culturally relevant pedagogy in teacher preparation programs, and insufficient resources and professional development needed to teach culturally diverse students.

During the onset of this study, each participant answered the question, "What does culturally relevant pedagogy mean to you". This question allowed me to assess if teachers displayed a foundational knowledge of the pillars of culturally relevant pedagogy. This question also allowed me to observe if teachers were interpreting the principles of culturally relevant and culturally responsive pedagogy interchangeably. Furthermore, I was able to determine what practices teachers were implementing in their science classrooms that were contributing to the score on the EOC Milestone assessment. Through the self-audit evaluations, interviews, and focus group sessions I was able to gain insight into teacher implementation and practices as well as obtain information on teacher perspectives of their instruction and how it could become more effective. In doing so, the study provided teachers with the opportunity to share their experiences, needs, and frustrations.

Though only three themes are noted in the results section of this study, other concerns need notating. As mentioned, numerous times in the review of literature about this study, the lack

of planning and instructional time impeded teachers' abilities to be more effective culturally relevant teachers. Three teachers stated they did not have the adequate time needed to learn their students' cultures, develop relationships with all their students, and provide instruction specialized to meet the diverse needs of the students in their classrooms. Ansley and Paige both emphasized that the need for them to get through the standards so that students were prepared to take the EOG, hindered them from being more effective and responding to their student's needs.

Many of the themes that arose in this study align with the themes of the literature review section of this manuscript. Regardless of several past studies being conducted to determine teacher perspectives, knowledge, and dispositions behind culturally relevant teaching in science classrooms, little has been done to address these themes. By addressing the themes of this study and other studies about this topic, the state of Georgia and the country of the United States stand an opportunity to increase the effectiveness of science education.

Chapter 5: Discussion

The introduction of the manuscript provides a clear overview of the context and the research focus. It highlights the significant challenges faced by students in the state of Georgia, as evident by the low proficiency rates on the state-mandated Milestone high-stakes assessment. The requirement for teachers to implement practices that are relevant to students' learning and cultural needs, as indicated by the state's evaluative tool, emphasizes the importance of Culturally Relevant Pedagogy in addressing these challenges.

The decision to conduct a collective case study involving science teachers in Title I schools in North Central; Georgia demonstrates a targeted and focused approach to understanding how culturally relevant pedagogy is being implemented in Title 1 science classrooms. By examining the effective implementation of culturally relevant practices in science classrooms, the study aims to shed light on best practices and strategies that can potentially improve student achievement, especially among minority populations and students with language and essential skill deficits. This chapter provides an emphasis on synthesizing the findings, discussing implications, and limitations, and providing recommendations to the research of this study.

Review and Synthesis of the Findings

Drawing on Gloria Ladson-Billing's (1995) concept of culturally relevant teaching, I designed this study to examine the implementation of culturally relevant pedagogical practices in Title 1 classrooms in the state of Georgia. An in-depth analysis of the qualitative data collected from each participant in the form of evaluations, interviews, and a focus group session revealed teachers' practices, hindrances, and needs. The reflective nature of the evaluation, authentic interviews, and profound focus group discussion will provide beneficial implications to the state

of Georgia Department of Education. Thus, this study demonstrated there is a need to provide teachers with ample opportunities, time, and support to obtain and enhance their knowledge of the pillars of culturally relevant pedagogy and apply these pillars to their science instruction.

Implication of Culturally Relevant Pedagogy in High School Science

The implications drawn from the assessment of culturally relevant pedagogical practices in Title I science classrooms raise critical concerns about the state of science education, especially in diverse and underprivileged communities. The finding that teachers refrain from implementing effective strategies due to fear of reprimand highlights the significant challenges educators face in navigating the complexities of educational policies, government stances, and societal controversies related to diversity and inclusion. This implication emphasizes the urgent need for supportive and inclusive policies that empower teachers to implement culturally relevant practices without fear of consequence. There is no ground for teachers and other educational leaders to ignore culturally relevant because there are proven benefits for all students (Cartagena Collazo & Hendrix-Soto, 2023). Addressing these concerns requires a concerted effort from educational policymakers, school administrators, and stakeholders. Providing teachers with the necessary resources, training, and a supportive environment can help alleviate their apprehensions, and may enable them to implement effective instructional strategies tailored to the diverse needs of their students.

The study's second finding was the lack of focus on cultural relevance in teacher preparation programs, which points to a crucial gap in the training of future educators. Carter Andrews (2021) states, "One of the challenges that have plagued the field of teacher education is our inability to prepare primarily white, middle-class women to effectively attend to the academic needs of youth from a wide array of racial and ethnic backgrounds in ways that take

into account teachers' and students' lived experiences and realities in a settler colonial, white supremacist society". Given the changing demographics in the state of Georgia, marked by an influx of new residents, many of whom are minorities, it becomes imperative for teacher preparation programs to evolve and equip educators with the skills, knowledge, and experiences necessary to meet the needs of this increasingly diverse student population. A more comprehensive approach to teacher training should include culturally relevant pedagogy as a foundational component. This training should focus on fostering cultural competence, understanding diverse lived experiences, and recognizing the impact of societal structures.

The study's third finding, regarding the insufficiency of professional development and resources available to teachers, raises critical concerns about the support systems in place for educators striving to implement culturally relevant pedagogy in their classrooms. The state of Georgia's requirement for teachers to provide relevant instruction signifies the importance of ongoing professional development in culturally relevant pedagogy to ensure that educators are equipped with the necessary skills and knowledge to meet these expectations. The participants' feedback, indicating a lack of professional development opportunities on the topic of culturally relevant pedagogy, underlines a systemic issue within the state's education system. Insufficient training in this area leaves teachers without the necessary tools to effectively implement culturally relevant practices, hindering their ability to adequately address the diverse needs of their students. The potential impact of culturally relevant pedagogy is often undermined by a profound ignorance about culturally relevant pedagogy, and more importantly, an unwillingness to make structural changes at the organizational, school, and district levels to transform what they do with and for students of color (Dixson, 2021). By increasing the emphasis placed on

preparing teachers districts can anticipate the increase in student performance on high-stakes assessments.

The teachers' feedback regarding the lack of resources to support their students' learning highlights a significant challenge faced by educators in providing equitable science education. The absence of essential resources creates a barrier, especially when working with students who lack important background knowledge and experiences. Equitable access to resources is essential for bridging the gap in students' background knowledge and experiences. Adequate funding for schools, especially those in underserved communities, is crucial to providing essential materials Additionally, investing in professional development for teachers can empower them to create innovative and engaging lessons that cater to diverse learning needs, even in resource-limited environments. This highlights the importance of addressing resource disparities to ensure that all students, regardless of their backgrounds, have access to high-quality education.

Implications for Teacher Leadership

The implications of this study on the role of teacher leaders in science education identifies a crucial need for change in science education in the state of Georgia, particularly in response to the lack of student achievement on the science EOG and EOC Milestone assessments. The recognition that changes may be necessary in the state's curriculum, the alignment of assessments to standards, or teacher instruction. Teacher leaders, play a key role in the educational system that is vital in addressing these needed changes. They must be diligent in advocating for and driving these changes that are crucial to promoting the advancement of science education.

This study sought to assess the implementation of culturally relevant pedagogy in Title 1 science classrooms in North Central, Georgia. Based on the findings of this study it revealed a

significant trend in the implementation of culturally relevant pedagogical practices in science classrooms. While teachers are making a concerted effort to incorporate these practices, the implementation is often inconsistent and may not align with the three pillars of Culturally Relevant Pedagogy outlined by Ladson-Billings. One significant theme that arose was the lack of formal training or education on effectively implementing culturally relevant practices. The assertion by most participants in this study was that their knowledge was acquired through experience.

Moreover, the teachers in this study expressed feelings of limited in their ability to implement culturally relevant practices due to fear of being reprimanded and a lack of resources, identified significant challenges in their science classrooms. The fear of consequences created barriers for teachers to develop innovative and effective teaching strategies that align with culturally relevant pedagogy. Additionally, the issue of limited resources, as emphasized by Lotter et al. (2020) in a study conducted on teacher leadership in math and science, in which the teachers described how science and mathematics often required teachers to work with additional materials that were not always provided by their district. Teachers in this study stated they resort to using personal funds to purchase resources for their classrooms.

Teacher leaders play a significant role in advocating for essential changes and improvements in education, particularly in meeting the needs of diverse learners. Teacher leaders, operating at various levels—school, district, and national— must work to influence policies and practices that can enhance the educational experience for all students by advocating for an increase in resources, teacher preparation, and professional development specifically tailored to meet the needs of diverse learners.

Limitations

Although measures were taken to reduce limitations, a few were noted to include the small sampling of participants, the lack of racial diversity in focus group participants, and the participation of only Title 1 teachers.

A primary limitation of the study was the small sampling of ten teachers as participants from Title 1 schools in the North Central. Georgia area. Although there were some demographical, educational, and professional variances within the group of teachers, there were not enough participants to assess a complete implementation of the study regarding teacher's implementation of culturally relevant pedagogy in high school science classrooms. Despite the study researching teachers at different sites, the small sampling of participants provided limited insight regarding the influence of culturally relevant pedagogy in Title 1 science classrooms.

Another limitation of this study was the exclusive participation of African-American teachers in the focus group session. While the variation in age, teacher certification attainment, and professional experiences among the participants enrich the study's depth, the lack of ethnic diversity does limit the range of perspectives to those of a specific racial group. Future research could benefit from a more diverse representation of ethnicities within the participant pool. Different racial backgrounds bring unique perspectives, experiences, and insights.

The third limitation of the study was the participation of only teachers in Title 1 schools. While the focus on Title I schools aligns with the specific objectives of assessing the implementation of Culturally Relevant Pedagogy in this context, it does indeed limit the generalizability of the findings to a broader range of teacher implementations across different school settings. Expanding the participant pool to include teachers from various school types could provide a more comprehensive perspective on the challenges and successes of

implementing culturally relevant pedagogy in science education. It's evident from the state's low proficiency scores on the Milestone Assessment that a comprehensive assessment of teaching practices is crucial.

Recommendations

The following section contains practical recommendations for the state of Georgia and the implementation of culturally relevant pedagogy in its science classrooms. There must be an advocation for a more inclusive and culturally relevant curriculum at the national and state levels to create a foundation that encourages teachers to embrace diversity and implement effective teaching practices confidently. The joint efforts between policymakers, educators, and community stakeholders are essential to the development of educational environments where teachers feel empowered to provide high-quality culturally relevant instruction that meets the diverse needs of their students.

Moreover, to address the gap in teacher preparation programs, educational institutions in Georgia must be intentional about better preparing future teachers in their programs in creating inclusive and culturally relevant learning environments. These programs should not only provide theoretical knowledge but also offer practical strategies, resources, and classroom examples to help teachers integrate culturally relevant practices into their teaching effectively This approach will not only benefit the students by providing them with a more relevant and meaningful education but also supports perspective teachers in navigating the complexities of today's diverse classrooms. Ultimately promoting equity and enhancing the overall quality of education in the state of Georgia. In doing so, systems may see an increase in teacher retention due to teachers being better prepared for the challenges of the Title 1 classroom.

In addition, the state of Georgia must invest in comprehensive professional development programs that specifically focus on culturally relevant pedagogy. Providing access to relevant instructional resources, such as diverse literature, multimedia materials, and culturally inclusive curricula, can further support teachers in their efforts to create inclusive and engaging learning environments. Prioritizing applicable professional development and allocating resources to support teachers in implementing culturally relevant pedagogy, the state of Georgia can empower its educators to provide high-quality, culturally relevant instruction that meets the diverse needs of its student population. This investment is vital to the development of equitable educational experiences and improving outcomes for all students across the state. A collaborative effort between policymakers, school administrators, and community stakeholders is essential to advocating for an increase in funding and resource allocation. By addressing resource gaps, educators can provide students with the opportunities and experiences necessary to build a strong foundation in science education. This investment will not only be vital for individual student success but will also contribute to building a more equitable and inclusive educational system, that ensures every student has the chance to thrive in their academic pursuits.

Areas for Future Research

This study contributes to an existing body of research on culturally relevant pedagogy in science. This study provides insight into instruction that is implemented across the state of Georgia science classrooms. While there is a wealth of research on teachers' perspectives and knowledge regarding culturally relevant pedagogy, there is a notable scarcity of studies focused on effective teaching practices that can support teachers at various experience levels—preservice, novice, and veteran—in enhancing their instructional knowledge and implementing culturally relevant pedagogy effectively, especially in science classrooms. This gap poses

significant challenges, particularly for science teachers, as they lack concrete evidence and specific guidelines to support the integration of culturally relevant pedagogy, including Ladson-Billings' three pillars, into their instructional strategies. The need for research-backed practices is essential in providing science educators with the necessary tools, techniques, and resources to effectively incorporate culturally relevant pedagogy pillars into their teaching methods. Addressing these research gaps can have profound implications for science education. They can inform the development of targeted professional development programs, instructional resources, and curriculum materials tailored specifically to science teachers. By offering evidence-based strategies and practical examples, educators can gain the confidence and competence needed to integrate culturally relevant pedagogy effectively into their science classrooms.

Moreover, filling this void in research can contribute significantly to a broader discussion on culturally relevant teaching practices, and the promotion of inclusivity, equity, and diversity within the field of science education. It can empower teachers to create learning environments that resonate with students from diverse backgrounds, fostering a sense of belonging and promoting a positive attitude toward science education. investing in research that specifically explores effective implementation strategies for culturally relevant pedagogy in science education, the educational community can take significant strides towards fostering inclusive and culturally responsive science classrooms, ensuring that all students have equitable access to quality science education.

Conclusion

The purpose of this study was to assess the implementation of culturally relevant pedagogy in the Title 1 science classroom. This study provided me the opportunity to explore plausible causes as to why less than half of the students in the state of Georgia are proficient on

the states' EOG and EOC Science Milestone assessments. As the demographic makeup of the state evolves, it is crucial to adapt the curriculum, teacher preparation programs, professional development initiatives, and resource allocation strategies to ensure education equity for all students. The development of a new curriculum that incorporates diverse perspectives and culturally relevant content is essential to engage students and promote their academic success.

Additionally, silencing teachers and removing the autonomy of resources and instructional practices in their classrooms contradicts the expectations set by the TKES. Teacher autonomy, when coupled with appropriate guidance and support, enables educators to implement best practices, be innovative in their classrooms, and cater to the specific needs of their students effectively. Reprimanding teachers' districts diminishes the respect for teachers' expertise and their experiences in fostering collaborative and empowering educational environments. In addressing these aspects, policymakers, state, and district leaders can collectively pave the way for a more inclusive, equitable, and effective educational system.

Through this study, I aspire to increase conversation within the field of science education on the need for changes in curricula. With so few minorities aspiring to pursue careers in the STEM fields policymakers and Departments of Education must assess what needs to be changed to increase student engagement. I also hope that the participants of this study felt empowered and heard. As a fellow Title 1 science teacher I am in the fight to create future scientists by igniting the fire and sparking that curiosity our students once had for science. Some do science and some create scientists. We are the latter and arguably the most important.

References

Aikenhead, G. S., & Jegede, O. J. (1999). Cross-cultural science education: A cognitive explanation of a cultural phenomenon. Journal of Research in Science Teaching, *36*(3), 269–287. https://doi.org/10.1002/(SICI)1098-2736(199903)36:3<269::AID-TEA3>3.0.CO;2-T

Aronson, B., & Laughter, J. (2016). The theory and practice of culturally relevant education: A synthesis of research across content areas. *Review of Educational Research*, *86*(1), 163–206.

Blanford, L. (2011). An Examination of Essentialism and No Child Left Behind: Creating Excellence in America? *ESSAI, 8(1), 10*.

Boutte, G., Kelly-Jackson, C., & Johnson, G. L. (2010). Culturally relevant teaching in science classrooms: Addressing academic achievement, cultural competence, and critical consciousness. *International Journal of Multicultural Education*, *12*(2), 1–20. https://doi.org/10.18251/ijme.v12i2.343

Brown, J. C. (2017). A metasynthesis of the complementarity of culturally responsive and inquiry-based science education in K–12 settings: Implications for advancing equitable science teaching and learning. *Journal of Research in Science Teaching*, *54*(9), 1143–1173. https://doi.org/10.1002/tea.21401

Cartagena Collazo, E., & Hendrix-Soto, A. (2023). Empowering Latinx youth through culturally relevant pedagogy: A call to action. *English in Texas*, *53*(1), 27–34.

Carter Andrews, D. J. (2021). Preparing teachers to be culturally multidimensional: Designing and implementing teacher preparation programs for pedagogical relevance, responsiveness, and sustenance. *Educational Forum, 85*(4), 416–428. https://doi.org/10.1080/00131725.2021.1957638

Chen, M., & Gay, G. (2020). Culturally Responsive Teaching for the Children of New Immigrants in Taiwan: Perspectives of New Immigrant Parents. *Problems of Education in the 21st Century, 78, 1065*

Cooley, L., Brantlinger, A., Hannaford-Simpson, S., & Shahid, R. (2021). Presumed proficiencies, credentialism, and the pedagogy of poverty: Mathematics teachers from selective alternative route programs. *Journal of Mathematics Teacher Education, 24*(1), 61–87.

Creswell, J. W., & Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches* (3rd ed.). SAGE Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th Ed.). SAGE Publications.

Georgia Department of Education (2019). *Georgia Milestone Assessment System: End-of-Course (EOC) interpretive guide for score reports*. https://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Documents/Milestones/EOC-Resources/EOC_Score_Interpretation_Guide_2019-20.pdf

Georgia Department of Education (2018). *Validity and reliability for the 2018–2019 Georgia Milestones Assessment System*. https://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Documents/Milestones/2018-19_Georgia_Milestones_Validity_and_Reliability_Brief.pdf

Gray, R., McDonald, S., & Stroupe, D. (2022). What you find depends on how you see: Examining asset and deficit perspectives of preservice science teachers' knowledge and learning. *Studies in Science Education*, *58*(1), 49–80. https://doi.org/10.1080/03057267.2021.1897932

Hammond, Z., & Jackson, Y. (2015). *Culturally responsive teaching and the brain: promoting authentic engagement and rigor among culturally and linguistically divers students. Corwin, a SAGE Company.*

Horowitz, G., Domzalski, A. C., & Elizalde-Utnick. G. (2018). Can we teach science in a more culturally responsive way without sacrificing time or content? *Journal of College Science Teaching*, *47*(6), 8–10.

https://oraapp.doe.k12.ga.us/ows-bin/owa/fte_pack_ethnicsex_pub.entry_form

Hunt, T. C. (2023, August 26). *National Defense Education Act*. Encyclopedia Britannica. https://www.britannica.com/topic/National-Defense-Education-Act

Ivanova, I., Kozhuharova, P., & Todorova, R. (2022). Sustainable professional development through coaching: Benefits for teachers and learners. *Strategies for Policy in Science and Education*, *30*(5), 480–499.

Jahng, K. E. (2011). Thinking inside the box: Interrogating No Child Left Behind and Race to the Top. *KEDI Journal of Educational Policy*, *8*(1), 99-121. https://www.proquest.com/scholarly-journals/thinking-inside-box-interrogating-no-child-left/docview/1013971164/se-2

Jenning, J., & Rentner, D. S. (2006). Ten Big Effects of the No Child Left behind Act on Public Schools. *The Phi Delta Kappan, 88(2), 110-113.*

Johnson, C. C. (2011). The road to culturally relevant science: Exploring how teachers navigate change in pedagogy. *Journal of Research in Science Teaching*, *48*(2), 170–198. https://doi.org/10.1002/tea.20405

Kyung Eun Jahng. (2011). Thinking inside the box: Interrogating No Child Left Behind and Race To The Top. *KEDI Journal of Educational Policy, 8(1), 99-121*

Ladson-Billings, G. 91989). *A Tale of Two Teachers: Exemplars of Successful Pedagogy for Black Students.*

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465–491. https://www.jstor.org/stable/1163320

Ladson-Billings, G. (2022). *The dreamkeepers: Successful teachers of African American children* (3rd Ed.). Jossey-Bass.

Laughter, J. C., & Adams, A. D. (2012). Culturally relevant science teaching in middle school. *Urban Education*, *47*(6), 1106–1134. https://doi.org/10.1177/0042085912454443

Levin B. B. & Schrum L. (2017). *Every teacher a leader : developing the needed dispositions knowledge and skills for teacher leadership*. Corwin.

Loach, K. A. (2021). Science in elementary education: Teacher self-efficacy, preparation and student achievement. *Journal of Research in Education*, *30*(1), 1–28.

Lotter, C., Yow, J. A., Lee, M., Zeis, J. G., & Irvin, M. J. (2020). Rural teacher leadership in science and mathematics. *School Science & Mathematics*, *120*(1), 29–44. https://doi.org/10.1111/ssm.12383

Kondo, C. S. (2022). Walking the talk: Employing culturally relevant pedagogy in teacher education. *Teachers College Record*, *124*(4), 65–94. https://doi.org/10.1177/01614681221096797

Mack, A. L., (2021). *Cultivating culturally responsive elementary teachers in a suburban Title I school* [Doctoral dissertation, Kennesaw State University]. *Doctor of Education in Teacher Leadership Dissertations*. https://digitalcommons.kennesaw.edu/teachleaddoctd/55

Mackenzie, A. H. (2021). Editor's corner: Why culturally relevant science teaching is vital in our classrooms. *The Science Teacher*, *89*(2), 6–8.

Mathis, C., Southerland, S. A., & Burgess, T. (2023). Physics teachers' dispositions related to culturally relevant pedagogy. *International Journal of Science Education*, *45*(14), 1162–1181. https://doi.org/10.1080/09500693.2023.2190850

McGuinn, P. J. (2006). *No Child Left Behind and the transformation of federal education policy, 1965-2005. University Press of Kansas.*

Mensah, F. M. (2011). A case for culturally relevant teaching in science education and lessons learned for teacher education. *The Journal of Negro Education*, *80*(3), 296–309.

Mertler, C. A. (2019). *Introduction to educational research* (2nd Ed.). SAGE Publications.

Morrison, K. A., Robbins, H. H., & Rose, D. G. (2008). Operationalizing culturally relevant pedagogy: A synthesis of classroom-based research. *Equity and Excellence in Education*, *41*(4), 433–452. https://doi.org/10.1080/10665680802400006

Ngcoza, K., & Southwood, S. (2015). Professional development networks: From transmission to co-construction. *Perspectives in Education*, *33*(1), 1–11.

Norman, O., Meskimen, L., Ault, C. R., & Bentz, B. (2001). The Black- White "Achievement Gap" as a Perennial Challenge of Urban Science Education: A Sociocultural and Historical Overview with Implications for Research and Practice. *Journal of Research in Science Teaching*, *38*(10), 1101–1114. https://doi.org/10.1002/tea.10004

Riordan, M., Klein, E. J., & Gaynor, C. (2019). Teaching for equity and deeper learning: How does professional learning transfer to teachers' practice and influence students' experiences? *Equity & Excellence in Education*, *52*(2/3), 327–345. https://doi.org/10.1080/10665684.2019.1647808

Saint-Hilaire, L. A. (n.d.). So, how do I teach them? Understanding multicultural education and culturally relevant pedagogy. *Reflective Practice*, *15*(5), 592–602. https://doi.org/10.1080/14623943.2014.900026

Samuels, A. J. (2018). Exploring culturally responsive pedagogy: Teachers' perspectives on fostering equitable and inclusive classrooms. *SRATE Journal*, *27*(1), 22–30.

Sawadthaisong, N. (2021). Developing paradigms, patterns, and mechanisms for science teachers' professional development in area-based networks in Thailand. *Science Education International*, *32*(3), 273–278. https://doi.org/10.33828/sei.v32.i3.11

Shaver, A., Cuevas, P., Lee, O., & Avalos, M. (2007). Teachers' perceptions of policy influences on science instruction with culturally and linguistically diverse elementary students. *Journal of Research in Science Teaching*, *44*(5), 725–746. https://doi.org/10.1002/tea.20151

Saultz, A., White, R. S., Mceachin, A., Fusarelli, L. D., & Fusarelli, B.C. (2017). Teacher Quality Distribution and Equity in ESSA. *Journal of School Leadership, 27(5), 652.*

Stahl, N. A., & King, J. R. (2020). Expanding approaches for research: Understanding and using trustworthiness in qualitative research. *Journal of Developmental Education*, *44*(1), 26–28. https://doi.org/10.2307/45381095

Stake, R. E. (2010). *Qualitative research: Studying how things work*. The Guilford Press

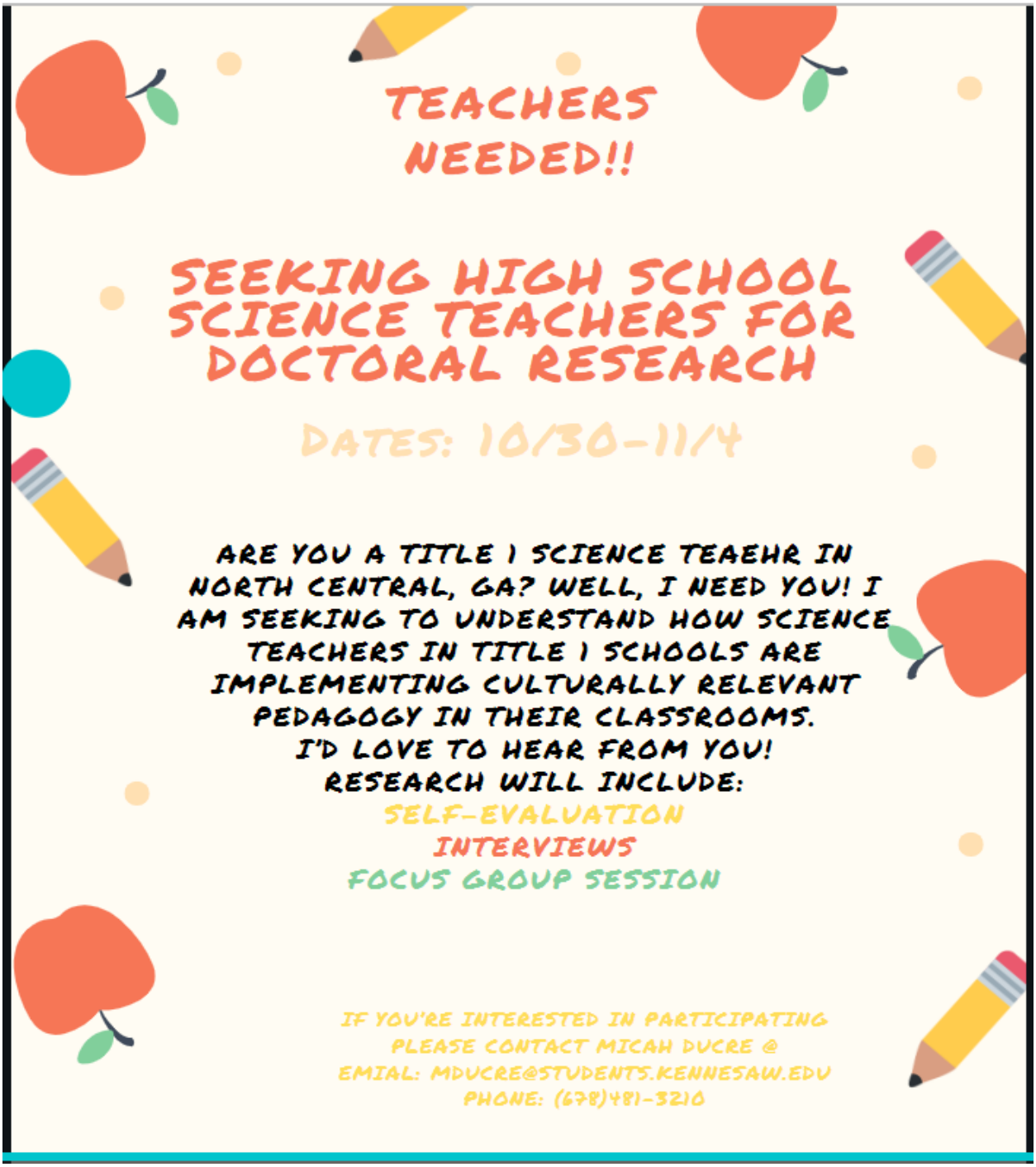
Tofel-Grehl, C., MacDonald, B. L., & Searle, K. L. (2022). The silent path towards medical apartheid within STEM Education: An evolving national pedagogy of poverty through the absenting of STEM-based play in early childhood. *Education Sciences, 12*(342), Article 342. https://doi.org/10.3390/educsci12050342

Underwood, J. B., & Mensah, F. M. (2018). An investigation of science teacher educators' perceptions of culturally relevant pedagogy. *Journal of Science Teacher Education, 29*(1), 46–64. https://doi.org/10.1080/1046560X.2017.1423457

Wissehr, C., Concannon, J., & Barrow, L. H. (2011). Looking back at the Sputnik era and its impact on science education. *School Science & Mathematics, 111*(7), 368–375. https://doi.org/10.1111/j.1949-8594.2011.00099.x

Wood, A., & Lewthwaite, B. (2008). Māori science education in Aotearoa New Zealand. *Cultural Studies of Science Education, 3*(3), 625–662.

Appendix A: Participant Evaluation Flyer



Appendix B: Self-Audit of Your Culturally Relevant Classroom

For each question, place a checkmark in the continuum box to represent the degree to which you consider yourself to be either implementing or refining

Description of classroom environment and planning	**Absolutely**	**In progress!**	**Not yet**
Environment			
Do your lessons incorporate a variety of learning styles?			
Are there established routines to support daily instruction?			
Do you have a strong sense of family and community among students in your class?			
Do you have visual representation in the room of all cultural groups that are represented within your school?			
Student Interactions			
Do you greet students at the door and have a room that invites the learner into the space?			
Are you aware of the diversity of students within your class (e.g., ELL, special education, gifted/ talented, race, ethnicity)?			
Do you create various groupings to ensure that all students are able to work with a wide variety of partners?			

Description of classroom environment and planning	**Absolutely**	**In progress!**	**Not yet**
Do you use a variety of high-engagement strategies to vary your instruction style?			
Are you considering the cultural needs of your students when selecting resources for lessons?			
Do students have the encouragement and support to succeed in class, even if they initially fail?			
Do you encourage students to work collaboratively in the majority of class activities?			
Do you set the expectation for high academic success for all students?			
Instruction			
Do you incorporate current issues in science within your content?			
Are you a facilitator of learning, rather than a presenter?			
Do you use multiple ways of teaching classroom content?			
Do you incorporate multidisciplinary concepts (e.g., the arts, music, literature, physical movement, diverse cultures) into your instructional plans?			

Description of classroom environment and planning	Absolutely	In progress!	Not yet
Do you provide multiple ways for students to demonstrate understanding of concepts?			
Do you allow your students to regularly discuss class topics and clarify understanding with each other?			
Do you have each day planned to ensure that you are meeting the diverse needs of the students within your class?			
Do you regularly reflect on your own assumptions about students, their capabilities, and how you can better support their learning?			

Shade, B. J., Kelly, C., & Oberg, M. (1997). Creating culturally responsive classrooms. Washington, DC: American Psychological Association. Adapted with permission. Shade, B. J., Kelly, C., & Oberg, M. (1997). Creating culturally responsive classrooms. Washington, DC: American Psychological Association. Used with permission.

Appendix C: Interview Protocol

Hello, my name is Micah Ducre, and thank you for joining me today for this interview to fulfill the requirements for my dissertation for my Doctor of Education degree in Teacher Leadership. Today we will be interviewing with questions focused on the implementation of Culturally Relevant Pedagogy in your science classroom. This interview will be roughly 15-25 mins. Please feel free to elaborate as much as you can on your answers. These questions are in no way intended to evaluate your instruction but will be used to inform the field of science education. Please note that all information collected in this session will be used for research purposes only and participants' names will not be stated in the final report instead a pseudonym will be used to protect your identity. Upon the completion of this paper, you will have the opportunity to review what is written and make any suggestions for change. Once again, I thank you for your participation and we will go ahead and get started…

1. Please share your journey to how you became an educator.
2. What does culturally relevant pedagogy mean to you?
3. How do you implement culturally relevant practices in your classroom?
4. Ladson Billings states there are 3 tenants of CRP. One is critical consciousness, she describes this as the ability to identify, analyze, and solve real-world problems, especially those that result in societal inequalities. How are you integrating this pillar into your classroom?
5. How are your lessons promoting high academic success and student learning?
6. What barriers are impeding you from being more culturally relevant in your classroom?
7. What supports/resources do you need to help move your instruction presenter to a facilitator style of teaching?

8. How can you become a more effective culturally relevant teacher?
9. Have you had any formal education on CRP? If so, please elaborate.

Appendix D: Focus Group Protocol

Focus Group Participants:_____	Participants Grade Levels: _____
Participants Gender: _____	Participants Ethnicity:_____
Focus Group Location: _____	Date: _____

Introduction:

Hello, my name is Micah Ducre, and thank you for joining me today for this focus group discussion. Today we will discuss Culturally Relevant Pedagogy in science. This session will be between 30-45 minutes. Each participant will have the opportunity to speak. When speaking please make sure your response is no more than 3 minutes long. Also, let's ensure we are respecting everyone and waiting until each participant completes their statement before responding. Please note that all information collected in this session will be used for research purposes only and participants' names will not be stated in the final report. I will begin by telling you the history of the curriculum and how it has evolved following that, I will be asking 6 questions.

Focus Group Questions

1. Describe your background in education.
2. When you hear culturally relevant pedagogy, what comes to mind?
3. What does Culturally Relevant Pedagogy look like in your classroom?
4. As educators who earned bachelor's degrees in science and became educators as a second career or career choice, how do you feel your content knowledge impacts your ability to be a CR teacher?

5. What barriers are impeding you from being more culturally relevant in your classroom? What resources or training have you been given to support you in addressing these barriers and being a better culturally relevant educator?
6. How did your teacher preparation program extend your knowledge of CRP? Do you feel like your teacher prep program equipped you to be an effective culturally relevant teacher in a Title 1 school? If so, how? If not, what do you feel was lacking?

Closing:

Thank you for participating in this focus group discussion. Please feel free to email me with any other questions or comments you may have. I will be taking our discussion and coding it for common themes that arose in the discussion and from there I will research them and use them for my final report. Once again names will not be mentioned, and identities will be confidential. Thank you again for your participation.

Appendix E: Consent for Participation in Research

Researcher: Micah E. Ducre

Title of Research:

Culturally Relevant Pedagogy in High School Science

Purpose of Research:

The purpose of this study was to understand how culturally relevant pedagogy is being implemented in the high school science at South Cobb High School

Benefits or Risks:

There are no inherent risks for the participants of the study, the only benefit is the opportunity for participants to reflect on how they incorporate science literacy into their classroom.

Consent Statement

I volunteer to participate in a research project conducted by Micah Ducre from Kennesaw State University. I understand that the project is designed to gather information about how culturally relevant pedagogical practices are being implemented in their science. I will be one of approximately four people completing a self- audit evaluation, being interviewed, or participating in a focus group session for this research project.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.

2. I understand that most interviewees will find the discussion interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

3. I understand I maybe asked to complete a 20-question self-audit evaluation that may take 5-10 minutes. Information obtained from the evaluation will be used to inform and develop interview questions.

4. Participation involves being interviewed by doctoral researcher, Micah Ducre. The interview will last approximately 15-25 minutes and/or Focus Group Session will be approximately 30-45 minutes and is composed of 5-10 questions. Notes will be written during the interview and focus group session. Zoom will be used to record the interview and focus group for transcription and subsequent dialogue will be saved using a password protected file.

5. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

6. I understand that complete confidentiality can not be guaranteed in my participation the focus group session. However, the researcher will use a pseudonym in final research paper to protect my identity.

7. I understand that research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, irb@kennesaw.edu.

8. I understand that my decision of whether or not to participate in this study will not impact my employment within my school district.
9. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

10. I have been given a copy of this consent form and I agree to participate in the research study.

11. If I have any questions, I can contact the researcher Micah Ducre at mducre@students.kennesaw.edu or Tamela Thomas (faculty advisor) at tthom388@kennesaw.edu

_____ _____

Participant Signature Date Printed Name

_____ _____

Principal Signature Date