EXPLORING PERCEPTIONS AND UNVEILING BARRIERS: ACCESS TO ACADEMIC RESEARCH EXPERIENCES FOR UNDERGRADUATE STUDENTS

BY

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Dedication

This dissertation is dedicated to all nontraditional students who dropped out of high school and were told they were not smart enough for college; guess what? You are smart enough, and the system failed you, so go get that degree. This dissertation is also dedicated to my wife Kristen, who dealt with many nights of writing and 6-hour class days on Saturdays and Sundays when our children needed time to be kids. Without her, this would not be possible. Thank you to my children, Kendall and Greyson; I hope this serves as an inspiration to you as you get older that despite my picture missing from the high school yearbook, I finished college three times. Thank you to every co-worker and friend who listened to me vent about my research, hopes, and dreams. Thanks to my parents for seeing this accomplishment as an inspiration and something they could be proud of. Lastly, thanks to my committee for their continued support and comments; without your guidance, I would still be writing Chapter 1. Thanks to every faculty member at Saint Louis University I had random conversations with about my dissertation that took the time to change my frame of thinking and led me down a path of less resistance as I moved forward in my research.

ABSTRACT

What are the implications for undergraduate students seeking higher education but have never been exposed to research experiences, either as a participant in a faculty-mentored experience, a federal research initiative/training grant, or as a participant (N-1)? This study addresses multiple variables and their potential to increase or decrease research participation among undergraduate students at two regional universities. This study also investigates to what extent Critical Race Theory tenets correlate with the increase or decrease of research participation among undergraduate students.

Chapter I – Introduction

In a world quickly changing to become more research-focused, undergraduate research prepares students to take positions in the university and private sectors. Research at the undergraduate level benefits a research-driven economy and research universities. While benefits are highly macro, from a micro perspective, students also gain real-world research experiences that can catapult them quickly from undergraduate research institutions to some of the best medical schools in the United States and directly into highly lucrative for-profit research positions (Adebisi, 2022).

While the benefits of research are plentiful, unfortunately, most are classist and inherently skewed, with benefits contributing to white people, often leaving Black citizens and undergraduate students out of the fray. Research participants, either active research team members or research participants, should reflect global and national diversity, cultural conditions, and uniqueness. Having a research population that is not diverse can lead to serious ethical and research consequences (Palmer & Burchard, 2021). Over the years, clinical research has shown as much as a 75% difference in how different races react to other drugs. For example, in medical research studies, 75% of Pacific Islanders cannot convert certain active ingredients of medicines, raising the risk of the said drug for all Pacific Islanders (Oh et al., 2015).

For years, the *New England Journal of Medicine* has been publishing studies and articles that are unrepresentative of the general population (The Editors, 2021). Many of the clinical trials being run today and have been run in the past have egregious gaps in representation with concerns about ethnic diversity and race (The Editors, 2021). The literature points to several critical issues in why such a large gap exists in trial generalizability, some of which include inflexible work schedules, mistrust of the medical system to which participants are committing,

representative samples and populations of researchers, and a history of mistreatment (The Editors, 2021).

Students graduating today are well aware of what they must face coming out of college. Universities and higher education institutions are more responsible now than ever in preparing students to address the complexities and issues of the current times (Cauthen, 2016). Participation in research for undergraduates (UG) is essential in learning about research universities; the practice of research and research participation has emerged as one of the most correlated variables in the success of medical studies (Kharraz et al., 2016).

More importantly, experiences had during university experiences and curriculum and develop socially responsible leadership poising activities of research during undergraduate studies to be a way and theory to create more socially adept and accountable leaders in today's society. Students graduating today are well aware of what they must face coming out of college.

Purpose of the Study

This dissertation investigated two specific aims to understand critical predictors of undergraduate student participation in university-led research. Participation was defined as either a participant on the research team conducting one's research or a participant who is part of the university research study sample. Research question 1 identifies what demographics and other unknown variables were vital predictors of student research participation. Aim 1 will also investigate undergraduate students' perceptions of university research or research in general.

The second specific aim sought to define better intrinsic and extrinsic motivators associated with undergraduate research participation. More specifically, did an increase in stipends increase research participation among undergraduate students as part of a sample in research? This study presumed that if an increase in involvement is not associated with a

monetary stipend, there would be other intrinsic motivators for students to pursue research, either as (a) research participants or (b) active research team members.

Framework

Critical Race Theory, or (CRT) is the theoretical framework used for this dissertation. By using CRT, I was able to focus on the experiential knowledge of students of color at undergraduate universities and gain a broader perspective of their perceptions and motivations. Those variables relate to their unique cultural and ethnic experiences. More specifically, CRT, in this instance, was used to examine not only how racism affects the research experiences and outcomes of entire groups of people but also individual UG students (Graham et al., 2011).

CRT has been used for many years in educational literature to illustrate the impact of racism on individuals' educational experiences, outcomes, and opportunities. Many researchers believe that CRT cannot be used as a quantitative method; however, one researcher illustrates just how much impact CRT can have as a quantitative framework for educational research (Sablan, 2018).

Critical Race Theory

CRT was born from critical legal studies. CRT seeks to investigate and better understand the intersection between race, law, and discrimination and their connection. CRT is not a way of implementing the law but a way of analyzing the decision of the law. For example, Brown v. Board of Education of Topeka, 347 U.S. 483 (1954) v. Board of Education, was seen through the public eye as a great success for the civil rights movement. CRT analysis would argue that the decision was more of an aligning of white interests with Black goals, which serves as one of the tenets of CRT (Crenshaw et al., 1995). As a theoretical framework, CRT will allow better

analysis of the structural systems that persist in higher education and lead to poorer outcomes for students of color because of access to research and perceptions of research (Sablan, 2018).

Using quantitative data to interpret the results of this study with CRT as the framework is essential since quantitative data can drive public consumption and interest in this dissertation research (Sablan, 2018). More importantly, using quantitative methods through a CRT lens is beneficial for science because of the largely absent amount of quantitative method-driven research concerning CRT and Quantitative methods, which is generally seen as a non-bias research practice can lead to the non-bias reality and nature of CRT, potentially shedding new light on often not researched areas in areas of discrimination and education inequality (Sablan, 2018). Non-biased analytics research around CRT is needed because CRT is often seen as a legal theory or research focus that, in its very nature, is a biased practice. Historically, researchers have been more likely to use qualitative methods due to the perceived notion of objectivity and the paradigms at work, the historical use of qualitative methods in CRT research (the way the research has always been done), and in someone perceived as biased theory how statistics could be perceived as opposed to paradigms and lived experienced reflected in qualitative methods (Sablan, 2018).

While research using quantitative methods in educational research and the disparities associated with students of color is well documented and certainly a part of modern research, few studies have taken a critical approach to defining and emphasizing students of color's assets rather than their deficits. Few quantitative research studies using CRT have examined the overarching structure of racism and racial inequality to frame an interpretation of racial inequality (Sablan, 2018).

While the idea of using a non-biased research method has possible positive outcomes, negatives exist as well. Historically, the only critical quantitative methodological research in CRT has focused chiefly only on descriptive statistics, which, while non-bias and "color-blind" don't get to the root of the problem or motivations behind actions, and while non-bias numbers don't lie, can be interpreted and perceived in different ways because data points driven from data sets like the census, are not always an accurate snapshot of the general population. Descriptive statistics also highlight outcome differences among groups, which can be essential but still miss the larger macro-level importance of racial differences and inequities (Sablan, 2018).

Operationalizing University Research

Specific terms and definitions must be described/defined to fully understand the meaning of research participation. The critical variables needed to understand research participation are research, university research, university research rankings, participation, and participants.

Research

According to The Office of Research Integrity in the US Department of Health and Human Services (HHS), research is defined by CFR 46.102(d)) as "A systematic investigation (i.e., the gathering and analysis of information) designed to develop or contribute to generalizable knowledge" (The Office of Research Integrity, 2019). HHS also states that research aims to extend human knowledge of all sciences. More importantly, research uses the scientific method instead of just digesting or consuming information (The Office of Research Integrity, 2019).

University Research

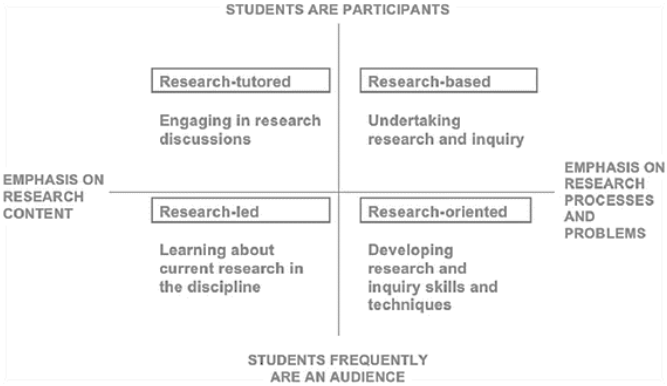
Different types of research emerge from various departments at the university. The Office of Sponsored Projects and professor-led research will differ from the research done by the Office

of Institutional Research. Defining research and participation in research can be extremely confusing and convoluted, considering the different types and levels of research at a university. Different models over the years have focused either (a) on the teaching role and research or (b) on the researcher role, tending to focus on experiences and research outside of the classroom (Brew, 2013).

For this study, one of the older models by Healey and Jenkons (2009) was used to operationalize university-led research. According to Healey and Jenkins (2009), students can engage in research in multiple ways. Their research showed that students can fit into different quadrants when participating in research. For example, a student can be a participant or in an audience. Depending on where that student falls in the research participation quadrant, that student will receive more benefits from research. Figure 1 below, shows multiple ways research participation can be defined. For this study, research participation was built from previous research by Healey and Jenkins using terms such as participant and audience.

Figure 1

Healey and Jenkins Model of Research Participation



Note. Figure taken from Lopatto, D. (2007). *SURE III – Undergraduate Research Experience Surveys*. https://sure.sites.grinnell.edu/sure-iii/

Research University Rankings

To understand research universities and how research participation is operationalized, a discussion needs to be had on research university rankings. The rankings concerning research universities are defined as either “very high” or “high” levels of research output. According to the American Council of Education (2022), “high” and “very high” levels of research output are defined as having awarded at least 20 research/scholarship doctorate degrees.

Once a year, The Carnegie Institute ranks universities on a “level of research activity” scale to determine if the university's classification should be R1, R2, or R3. Universities being analyzed using the “level of research activity” scale have already met previous criteria to be included in the ranking if awarded at least 20 research doctorates or 30 professional practice doctorates (American Council of Education, 2022).

Research universities can be segmented into different categories; concerning research output, there are institutions with doctoral degrees and those without. Also, there are institutions that grant master's and doctoral degrees, then institutions that only offer master's and bachelor's degrees. Some institutions do not offer master's or doctoral degrees and only offer bachelor's degrees, but still participate in university research. Bachelor's degree-only granting institutions are not research-ranked; only doctoral and master's universities are ranked. Still, master-only intuitions are only ranked by the program size, not the output of the research activity.

Doctoral universities are ranked as R1, R2, or R3 institutions. R1 institutions have very high research activity, and R2 Doctoral Universities have high research activity. R3 has moderate activity. Very high research activity is a university awarded at least 20 research doctoral degrees or 30 professional doctorates per year. Research universities falling into the first two categories of R1 and R2 must have at least $5 million in total research awards reported

through the NSF Higher Education Research and Development Survey (American Council of Education, 2022). R2 research universities are defined similarly in theory but separated by 100 unique variables used by the Carnegie Foundation to separate higher-performing research institutions from less-performing institutions (Seecharan, 2020). The change between R1 and R2 status is highly competitive, and universities fight hard to keep their R1 status. For example, from 2015 to 2018, only 16 universities could jump from an R2 to an R1 research institution (Seecharan, 2020). Furthermore, universities ranked as R1 from 2010 – 2020 awarded more doctorates to individuals who had earned their bachelor's degrees from R1 institutions, meaning those who attended an R1 institutions were more likely to be awarded a doctorate from any institution (National Science Foundation, 20 CE).

Further illustrating and bridging the issues and barriers to research participation, 15% of Black and 14% of Hispanic doctorate recipients disproportionately earned their bachelor's degree from public master's institutions that only awarded up to a master's degree. In comparison, 13.6% of white doctorate earners received their bachelor's from private baccalaureate colleges, making white earners the only group above 11.9%. Strikingly, of all doctorate earners in the United States, 49% of those white doctorate recipients earned their bachelor's from an R1, while only 36.2% of Black students earned their bachelor's from an R1 institutions (National Science Foundation, 2022).

Defining Research Participation

For this study, one of the older models by Healey and Jenkins defined Research participation. Refer to Figure 1 for a detailed graph of the quadrants of research participation. According to Healey and Jenkins (2009), students can engage in research in multiple ways. Their

research showed that students can fit into different quadrants when participating in research. For example, a student can be a participant or in an audience.

For this dissertation, "research participation" was defined as being an active participant or part of the sample (in a research audience or part of a class) or an active study team member on a research project. Research projects come in all shapes and sizes, and to adequately measure the full scope of opportunity, research participation must be defined both ways: as an active study sample and as a team member. Noting that exposure may happen in many ways for undergraduate students, both serving as part of a sample or a participant can count as "research participation to increase the sample size of this study (Brew, 2013).

Barriers to Research Participation and Perception

Difficulties for recruitment into research for students and people of color (POC) are well documented, and perceptions of research are also well researched among POC (Carter-Edwards et al., 2002). For this dissertation, perception as an influential variable was investigated to understand better the generational changes in the perception of research among POC.

Barriers to research exist among all students and people. The literature refers to other macro and micro barriers for POC and Students of Color (Denson & Chang, 2009). Research suggests the discrepancies in the racial diversity among faculty and mistrust of white men lead to a lack of undergraduate research participation among Students of Color (Denson & Chang, 2009). Other variables could be at play, such as access to knowledge and funds, student priorities, times, and exposure.

Research Motivations and Incentives

This study looked at whether an increase in incentives increases one's motivation, intrinsic or not, to participate in research studies. More importantly, were our motivations different among different races and ethnicities concerning undergraduate research participation?

Research Questions

This dissertation investigated two specific aims to understand critical predictors associated with undergraduate student participation in university-led research. "Participation" was defined as either a participant on the research team conducting one's research or a participant as part of the university research study sample. Research question 1 identified what demographics and other unknown variables are critical predictors in student research participation. Aim 1 also investigated the perceptions associated among undergraduate students concerning university lead research or perceptions of research in general.

The second specific aim helped to define intrinsic and extrinsic motivators associated with undergraduate research participation. The second aim asked if an increase in monetary stipends for university-led research increased the likelihood that a student would participate as part of a sample in research. This research study also analyzed if other intrinsic motivators caused an increase in research participation as (a) a research participant or (b) an active research team member.

Research Question 1: To what extent are specific demographic characteristics and other unknown variables associated with increased or decreased research participation among undergraduate students? Research question one aimed to answer what demographic factors contribute to barriers related to undergraduate student participation in university-led research. Research question 1 helped to lay the groundwork for defining key characteristics and

variables associated with the research sample used in the quantitative analysis of this dissertation. Survey questions were also utilized to analyze perceptions of research as a critical variable in relation to demographic factors, further extrapolating differences in research participation among different races and genders.

Research Question 2: To what extent does an increase in monetary motivations increase research participation among undergraduate students, and does more exposure to research and knowledge of research increase participation in research participation among undergraduate students? Research question two addressed motivations, both intrinsic and extrinsic, in relation to research participation among undergraduate students. A survey was developed using "The Survey of Undergraduate Research Experiences" or (SURE III). Previous literature on barriers pertaining to decreased research participation among undergraduate students was also used in the designed survey to help answer Research Question 2.

Research Question 3: To what extent does requiring research participation as part of a university student learning plan increase the students' perception of the likelihood of meaningful employment upon graduation? This question sought to investigate if participating in research increased the students' perceptions of achieving meaningful employment upon graduation from the university program they are enrolled in. Meaningful employment is addressed through survey questions pertaining to whether a student perceived research to benefit them in their career objectives.

Research Question 4: To what extent do the seven tenets of Critical Race Theory correlate in research participation among students of color? This portion of the research study investigated if one tenet more than the other six plays a more significant role in increasing or decreasing research participation among students of color.

Chapter II - Review of Current Literature

Many clinical trials being run today and that have been run in the past have egregious gaps in representation with concerns about ethnic diversity and race (The Editors, 2021). The literature points to several critical issues in why such a large gap exists in trial generalizability, some of which include inflexible work schedules, mistrust of the medical system to which participants are committing, representative samples and populations of researchers, and a history of mistreatment (The Editors, 2021).

Students graduating today are well aware of what they must face coming out of college, and universities and higher education institutions are more responsible now than ever in preparing students to address the complexities and issues of the current times (Cauthen, 2016). Participation in research for UG students is essential in learning about research universities and the practice of research. Past research shows that research participation has emerged as one of the most correlated variables in the success of medical studies. Being so closely correlated with the success of medical research, university research remains an important aspect to generalizability in medical research (Kharraz et al., 2016).

Experiences had during university research and research curriculum can develop socially responsible leadership. Being a part of research activities during undergraduate studies can also be a way to create more socially adept and accountable leaders in today's society (Kharraz et al., 2016.

Positive Effects of Research Participation

Creativity is now recognized as a students' most crucial abilities in dealing with the world's most contemporary issues (Álvarez-Huerta et al., 2022). Similarly, undergraduate

research is correlated with undergraduate cognitive growth, creativity and a pathway for students to become research scientists; furthermore, undergraduate research is an effective tool for learning the type of investigations that occur in the scientific method most closely related to the major of the student (Kortz & van der Hoeven Kraft, 2016).

Another positive effect of university research as part of a holistic educational experience for undergraduate students could be the "leveraging of educational involvement." Students who have been shown to have a well-defined goal and plan are more likely to be knowledgeable about the resources available at the university. Students participating in undergraduate research also tend to focus more closely on the three subtasks outlined by Cauthen, (2016) in their article concerning the development of more socially aware students, research as part of a curriculum plan involves faculty. Faulty as part of an educational involvement plan can provide mentorship and exploration of their selected curriculum (Cauthen, 2016).

Research has also shown that students who participate in university research as part of a holistic educational experience share a more favorable view of the undergraduate program they are participating in (Bowman & Waite, 2003). The possibility also exists that those participating in research in their field are more likely to continue professionally in their chosen major. Students in the same study also indicated that they had a better understanding of the major field if they participated in a research study. Research findings point to students having a better understanding of their field due to having more time to openly discuss their fields with peers and mentors in their major field (Bowman & Waite, 2003). Satisfaction with program choice can also be positively correlated with volunteering in research studies at an undergraduate level; again, this may be because students involved in research have more opportunities to discuss their field with peers and mentors (Bowman & Waite, 2003)

A recurring theme of a 2013 study indicated that programs providing undergraduate research experiences gave students the confidence to pursue independent graduate studies and programs (Chapes & Velasquez, 2013). Knowledge, experience, and confidence are reoccurring trends in why students do not engage in undergraduate research experiences. Furthermore, they do not continue biomedical graduate studies or pursue their Ph.D. or MD (Chapes & Velasquez, 2013).

Intersectionality, Demographics, and Barriers to Research Participation

Peter Wade (2014) discusses in his research that the ability to discuss and practically analyze when race is a crucial influencer of data is paramount to having a clean and quality data set. If researchers cannot determine if race is at work, other key variables that define human participants, such as gender, ability, or socioeconomic status, cannot be further investigated. While race significantly determines the previously noted characteristics, intersectionality deals with multiple vital factors. Research should continue to define how to further involve a generalizable sample that includes many different races (Bernstein, 2019).

Past research is well-documented concerning the issues and troubling trends associated with building a generalizable sample for university research (Ejiogu et al., 2011). Research also points out how people of color are often not retained and often become outliers in research data sets (Ejiogu et al., 2011).

Intersectionality

Intersectionality is grounded in Black feminist and critical race theories. The term Intersectionality was first presented in 1989 by legal theorist Kimberlé Crenshaw to show how the structures and legal system in the United States serve as a "theoretical erasure" of Black women and is considered a real multifaceted connection that exists for all people between our

race, gender, politics, and structural infrastructural identities (Harris & Patton, 2018). Importantly, intersectionality was and still is considered a lens viewed through Black women and is considered feminist. Some scholars would argue that only considering intersectionality as a framework for research does not consider that intersectionality provides a framework that deliberately focuses on the social dynamics that affect people. Feminists would argue that intersectionality loses some of its "teeth" as the theory crosses many different cultural groups. (Tefera et al., 2018). To better understand intersectionality, I discuss three concepts of intersectionality described by Dr. Kimberlé Crenshaw (Crenshaw, 1991.

Structural intersectionality, according to Crenshaw, refers to extrinsic factors of oppression that are a part of someone's identity. For example, in women that are frequently victims of rape and women of color, their structural intersectionality is often burdened by poverty, childcare responsibilities, and a lack of job skills (Crenshaw, 1991). Frequently, these forms of class oppression are largely due to gender and class and are often compounded by race-related discrimination in employment practices against women of color. Such structural variables of intersectionality can be defined as the systems of race, gender, and class domination. For this dissertation, forms of structural intersectionality are essential to remember, as the survey results presented in this dissertation are primarily viewed through a lens of intersectionality and educational experiences/opportunities.

If intersectionality is considered an intersection of the critical variables that make up human social identity, then the term Political Intersectionality must be further explained in this dissertation. According to Crenshaw, women of color face an issue with Political intersectionality, meaning they are pulled between two political identities that men of color and white individuals do not experience. Specifically, theories of change and political discourse are

often grounded in both gender and race, meaning a woman of color cannot experience the same discourse associated with both the feminist movement, which was associated with white women, and the civil rights movement, which was associated with change for Black men. Political intersectionality affects women of color and men of color differently because of those intersecting identities associated with how political discourse and change are made (Crenshaw, 1991). More importantly, for this study, how do political and educational discourse affect the positive and negative experiences associated with undergraduate research and the students accessing said experiences?

Representational Intersectionality is most closely related to the intersection of identity variables such as gender, race, and sexuality and how those variables guide and fuel perceptions of women of color in various forms of media, including but not limited to television, print, and film (Crenshaw et al., 1995).

Lastly, intersectionality should be understood as a framework or lens used to conceptualize a person, group, or social problem through the discriminations and disadvantages that the person, group, or social problem persists through time and space. Intersectionality takes into account the entire picture, not just the person. For example, a Black woman may have varying overlapping identities and experiences that need to be fully considered to understand the complexities associated with racism (Tefera et al., 2018).

Demographics

For this study and the reporting of demographic data in universities, 2021 and 2022 will be excluded due to the extraordinary circumstances surrounding enrollment in American higher education. However, undergraduate and graduate student data remained at ~20,000,000 in the

years 2021 and 2022, showing no actual increase compared to the ever-growing university population since the 1970s (Hanson, 2019).

Universities are multi-national and multicultural environments comprised of students of varying backgrounds from many different points in their lives (Inside Higher Education, 2020). As of 2020, 51.6% of university students self-reported as white or Caucasian. As an entire population, white student participation in higher education has increased by a total of 185.5% since 1976 as part of the entire student body (National Center for Education Statistics, 2022). 12.5% of students report being Black or African American, 19.4% are Hispanic or Latino, and 0.26% are Pacific Islanders (National Center for Education Statistics, 2022).

Critical Race Theory

Below, there will be a discussion on Critical Race Theory. There is an included outline and subheading for each tenet of Critical Race Theory, which is covered in more depth on the next page, and all tenets are subheadings below. Critical Race Theory, or CRT, originated from a need to view racism in our legal system through a different lens and was initially developed to work with scholars who focused on legal sciences (DeCuir & Dixson, 2004). Recently, CRT has been used more broadly in higher education, and the first tenet of CRT, reverse story-telling, has been used more widely (DeCuir & Dixson, 2004).

The demographics of students in American higher education as of 2020 favor white students versus students of color, meaning that increasing research participation among students of color may prove difficult due to the sheer difference in demographic data.

A framework that fully defines disparities in modern education must be presented to understand demographic disparities in research participation. Critical Race Theory (CRT) and fundamental principles of CRT scholarship include eight core principles to help define

demographic inequalities in university research participation. More importantly, how can a framework for barriers in undergraduate research be correlated to the below eight tenets of CRT (Lemelle, 2009)?

CRT persists that racism is endemic and ingrained in our culture and society. Racism is something society uses in our language and has become so ingrained in our everyday lives that society often misses it or simply ignore it. CRT also states that The Civil Rights movement and laws that followed the Civil Rights Movement need to be readdressed and revisited because some laws no longer serve people of color in the United States. More importantly, those laws have never been for the benefit of the people they were meant to serve but an interest convergence and reflection of white supremacy.

Color Blindness Concepts and ideas of being blind to color (color blindness) need to be addressed and challenged. The concepts of color blindness do little good for addressing the conversation of race in the United States and serve as a disservice to the Black community. Having a Voice Society and higher education institutions need to provide more adequate spaces for people of color to have a voice. This is especially true in Higher Education and institutions of learning.

Whiteness is property, or being white affords certain rights to property and "things" that POC have not always been allowed to own. Convergence of Interests Oftentimes, there is a convergence of interests between white people and POC. This convergence of interests can be good or bad, but the bad is often seen in politics. Counter-Story-Telling There needs to be conversations that involve counter-story-telling between people of different races, thus opening up the conversation for all people in our society. Lastly, an interdisciplinary perspective on counter-story-telling in the higher education environment needs to be included.

Critical Race Theory has roots in legal theory and the observance of white supremacy, and it ties to legal actions taken in the United States. For example, *Brown v. Board of Education of Topeka, 347 U.S. 483 (1954) v. Board of Education* is seen as a win for desegregation in the eyes of most; however, as I will discuss in a conversation concerning interest convergence in a later paragraph, the convergence of interests is deeply tied to white supremacy because desegregation was closely aligned with the interests of white people in the United States (Sablan, 2018). In educational studies, CRT was adopted as a framework that looks at the centrality of race, racism, and white supremacy to describe the academic structure and social constructs/practices.

Racism is Endemic

Racism is endemic, or racism is permanent, and refers to the fact that racism is a component of American life that has been present since the beginning of American history and is a part of our history that exists (DeCuir & Dixson, 2004). In this context, the realist review asserts that organizations must admit that racism has always existed (DeCuir & Dixson, 2004).

Reinterpreting Civil Rights Movement and Subsequent Laws

CRT comes from legal theory, and most of the conversation around CRT started with the reimagining of laws stemming from the need to think about the white privilege associated with and the convergence of ideals mainly benefitting white people versus that of Black people (Hiraldo, 2010).

Challenging Color Blindness and Meritocracy

Color blindness refers to the practice of not seeing color or not respecting differences in races, cultures, experiences, and backgrounds. The idea of challenging color blindness and a

meritocracy refers to the challenge that all people are are not all equal, and our different experiences mean that our challenges and experiences are vastly different (Gibbs, 2022).

Space for Voices

Space for voices refers to the access to and ability to speak freely about race and injustice. Regarding Higher Education, a space for voices refers to safe spaces at the University that allow students of color to participate and provide input to fixing injustices at the higher education level (Patton et al., 2007). For this dissertation, spaces should be available for students of color to participate in university research.

Whiteness as Property

White people have the ability and privilege to own property, or in terms of CRT, have the rights to own certain pieces of property that were never afforded to Black people (Patton et al., 2007). Research at universities is done by primary investigators interested in a subject they have researched most of their lives. Unfortunately, there are far fewer Black professors/researchers than white professors and researchers (Gibbs, 2022). Participation in research and mentorship from university faculty are needed to learn from teacher scientists in the research/field of medicine (Gibbs, 2022). Whiteness as property argues that being white holds privilege or ownership over certain pieces of property both physically and figuratively. Property can be defined as an asset. Assets include education, housing, generational wealth, and other cultural and economic advantages. The argument has been made that education and, more importantly, higher education is a piece of property that is predominately owned by white individuals and not owned by POC, more importantly, races other than white (Ly & Gusa, 2010).

Interest Convergence

Interest convergence in CRT refers to the convergence of interests among different parties. Regarding CRT, this means that when the interests of other races at higher education institutions are well aligned, interests converge, and change happens (Hiraldo, 2010). Unfortunately, interest convergence can also be harmful. For example, after the civil rights movement, many Black men and women were given constitutional rights that had only been given to white men and women for many years. According to Hiraldo (2010), these rights were largely superficial since while the rights were a positive step for the Black community, they were given only as a way to converge interests with federal politics, i.e., a way to gain a vote for a party.

Counter-storytelling

Higher education has belonged to older white men; more specifically, counter-story-telling, or the ability for POC to tell their stories in higher education, has largely been blocked (Hiraldo, 2010). Counter-story-telling is defined in CRT as the ability to have cross-cultural dialogue in education and as a way to counter the dominant narrative rooted in whiteness. For this dissertation, a dialogue exists primarily between researchers and students of color. More so, if trust is a primary prevailing reason for inequities in research participation among students of color in university research, i.e., communication between races that build a bridge of trust to 1.) participate as an active participant conducting the research or 2.) taking part in research as a study sample/study participant, then counter-story telling serves to be an essential part in the boarding of study samples and student of color actively participating in research (Carter-Edwards et al., 2002).

Interdisciplinary Approach

All voices must be included when discussing the hierarchy and outcomes of an institution of higher learning regarding research and fixing an issue; all voices must be at the table to make a lasting change (Ejiogu et al., 2011).

CRT Criticisms

CRT was mentioned a total of 1,300 times on Fox News in less than 4-months and has become a rallying cry for the Republican party and extremists all over the United States. CRT has become a way for politicians to create party lines and ultimately villainize the theory of CRT (Ray & Gibbons, 2021). More importantly, creating laws outlawing CRT in states around the United States asserts the truth behind CRT, that racist people are not needed for racism to exist. Systems, the exact structure that CRT focuses on is proved with the division of CRT (Ray & Gibbons, 2021).

Arguments have been made that CRT, from the very beginning and the theories strands, starting with Du Bois in 1903, is based in Western thought and lacks the ability as a framework to create a "new world order" despite having CRT having roots in structural racism in the west (Mocombe, 2017) Since CRT has roots in the west, the idea for equality as it currently stands, while a human rights issue, is not a way to support the heritage and African history that is not addressed in CRT frameworks (Mocombe, 2017).

Barriers

Evidence suggests significant barriers exist for individuals in lower socioeconomic brackets to participate in research (Ejiogu et al., 2011). The demographic numbers are striking at a university. As previously mentioned, race and color play a part in scientific education, and

research scientists' mentorship creates a striking parallel between disparities in research participation.

Barriers for POC

Diversity in higher education and the makeup of Black individuals working at a university show a striking parallel between said disparities; for example, in 2016, only 7.2% of administrators were reported as Black, and then 7.9% in 2020 (College and University Professional Association for Human Resources, 2020). In 2016, 8.6% of faculty in higher education were Black. Then, in 2020, only 8.9% of faculty were Black, meaning in four years of our effort to DEI work, Black faculty numbers increased only by .4% (College and University Professional Association for Human Resources, 2020). The staggering difference between faculty races is alarming, so much so that it cannot be assume that our faculty knows the students they are teaching (Swartz, 2009). Swartz refers to faculty knowledge of their students being dismal because there are not enough faculty in universities that can relate to their students because of the intersectionality of race and culture (Swartz, 2009).

Research shows that when students enter schools, universities, or any educational environment, they will always bring their identities with them. Students should not be White washed in higher education, and because those identities exist, it is uniquely required that students know whom they are teaching, and students must know who is teaching them (Swartz, 2009).

Barriers for All Students

Qualitative research has been done globally, discussing the barriers that students face at the undergraduate level concerning study and access to participating in their research; many reasons for not participating in research conclude with five main variables associated with

nonparticipation. Some of those variables include the lack of funds to participate or spending time participating in research when other priorities are more important. All students face access to lab space; the assumption that all universities are equipped to fund, and house students in their labs or research spaces is a well-known fact in academics—knowledge of the student or perception of one's understanding of the research subject. Also, note time and priorities still play a large part in a student's reason for participating or not participating in research (Adebisi, 2022).

Lack of Funds, Access, and Knowledge

Participants worldwide continue to cite a lack of funds for participating in research. Lack of funds can be defined as either a lack of funding for the participant to spend their time in a research lab or a lack of funds because the program or lab lacks funding to support an undergraduate research student. Lack of funding could also pertain to the funding being spent on research instruments and programs required to complete a student's research project. One student cited difficulty accessing up-to-date patient information for their medical research (Adebisi, 2022).

Participants in one research study cited a lack of access to research labs at their institutions or a lack of favorable and functional lab spaces for them to complete their research projects. Some participants cited a lack of knowledgeable professors at their undergraduate institutions. Research shows that knowledge of research and the subject go hand in hand, and if facilities are available and adequate, access and knowledge will also be adequate (Adebisi, 2022). Participants also stated their lack of proper knowledge when applying for university research assistantships. In many research studies, the idea of students lacking the proper credentials, not being smart enough, or not being adequately prepared in their minds continues to appear as a striking barrier to participation in research (Adebisi, 2022).

Time and Priorities

Participants on a global scale cited a lack of time or had other priorities concerning their educational obtainment (Adebisi, 2022). Many students locally state that they had no interest or that the study would not serve them academically, so why participate in the study? Students also noted that with a busy schedule, they did not have the space to fit research into their busy schedules, hence why research should offer more credit and be a part of a holistic undergraduate education experience in American Higher Education (Bowman & Waite, 2003).

Motivations to Participate in Research

There are many different motivations to participate in research both as a student actively involved in running their own research projects, and as a student taking part in a research n.

Perceptions of Research

Research is well documented about the difficulties in recruiting POC, specifically Black students and participants, to university and medical research (Carter-Edwards et al., 2002). More importantly, perceptions of mistrust of medical research exist, and mistrust may potentially exist for students to participate in research both as a participant and as an active member of the research team

For many years, people of color have stressed a feeling of distrust for research, especially medical research. The distrust of research in higher education is no different due to most research enrolling participants not only from medical research, which has been regarded as untrustworthy, but also from studies not considered medical studies (Suite et al., 2007). From the beginning and advent of medical research in this country, research was done on stolen Black corpses to research human anatomy, so much so that special grave sites for stolen Black bodies and unnamed

participants have been created in places like Memphis, TN, and New Orleans LA (Suite et al., 2007).

Examples in American history exist that would appall us by today's IRB standards. Still, historically, experiments have always been done on people of color; thus, those people of color are treated as less than human. Such experiments include the more well-known examples like the Tuskegee experiments to lesser-known examples like the story of Dr. Thomas Hamilton, who once left his slave in a deep hole in the yard just to test the efficacy of a heat stroke medication that he was developing (Suite et al., 2007).

Mistrust against research among members of the Black community in the Southern States of the United States has become a shared space and even become part of the ordinary everyday language among Black people. Examples include the term "Mississippi appendectomy," which refers to the routine and regular sterilization that Black women faced when going to their primary care physicians for routine procedures (Carter-Edwards et al., 2002).

Research shows that Black respondents at a medical research level are far less likely to respond to research surveys than white participants, meaning that research findings are, more often, not generalizable (Smith et al., 2002). Research also shows that that Black respondents felt like information from the research study concerning their health or research outcomes would be kept from them or researchers would lie to the Black participants about the research findings. Furthermore, Black participants taking part in research felt like they were more likely to be exposed to unnecessary risks when participating in a research study. To account for socioeconomic status and education as contributing factors to mistrust of the research system, Smith et al. (2002) used demographic and socio-status as critical variables and identifiers in their research, ruling out education as a key variable in mistrust.

Research has shown that verbal reinforcement using role-playing methodology can positively correlate with motivation for Black and white students (Graham, 1994). Students, both Black and white, asserted their motivation for their successes and failures; the correlation between the success and failure of a research study might be correlated with the intrinsic motivational factors associated with the well-being of others as the research may or may not be helping or hurting a community (Graham, 1994).

Incentives

Past research has looked at what drives students to participate in research at an undergraduate level. Research shows that student participation or nonparticipation in studies largely depends on how much extra credit students receive and the amount of financial incentive they are given for participating in a study. Students have also been shown to consider the adverse effects associated with a study before enrolling. Research has also shown that students will not participate in studies if they feel a lack of educational value in participating (Elicker et al., 2010).

On a past research study with 177 participants, the reporting group's highest percentage reporting (55.7%) why they did not participate in a research study stated that they had "time and scheduling conflicts." Of that 55.7%, 47.8% of the study group indicated they had no time or were too busy. 42.8% reported motivational issues, with the highest percentage being that the incentive was not high enough or insufficient points, and the student did not want to or had no interest (Elicker et al., 2010).

Peter Killeen's "Incentive Theory" (1982) looked at defining what an incentive was. His research (while based on animal subjects and not people) showed that an incentive was any type of reward that provided increased arousal, meaning that happiness or sadness, depending on how the subject is "aroused," can be defined as an incentive (Killeen, 1982).

While being "aroused" or incentivized is needed to define an incentive, more research has to be done on providing compounding incentives or, in terms of the methodology used by Carter-Edwards (2002), a small continuous incentive like a grocery store coupon given to Black individuals on a church roster not only helped garner participants but also helped in retaining those participants. Trial engagement or research participation is just as critical as recruiting individuals to studies; without participants staying in a study, their leaving can be detrimental to the results and data dissemination (Liu et al., 2017).

Research has shown that not a single type of incentive significantly influences the productive nature (+/-) of a researcher's output, other than the mix or variation in types of incentives (Jørgensen & Hanssen, 2018). While intrinsic motivations exist for students to participate in research, monetary motivational incentives cannot be overlooked. In one study, research showed that a more considerable monetary compensation increased participation among Black participants despite overlapping barriers associated with both Black and white individuals participating in the research (Ejiogu et al., 2011).

In the same way that incentives work, there can be negative incentives or incentives that do not benefit the participant in any way. In fact, those effects of a research study could harm the participant. In Adverse effects of research and the active effort to not consent participants, research has shown that access to education and understanding of consent has played a part in the enrolling of people of color into studies that they would not have normally consented to if they would have understood the study better, or the consent (Liu et al., 2018).

Federal Incentives

Training grants at the Federal Level (T Grants) support pre- and post-doctoral level students at domestic, private, public, and nonprofit institutions. The training by T grants is

intended to be mentored or led by senior-level scientists to mentor undergraduate and post-doc students in their intended discipline (National Institute of Health, 2022). Training grants include eight types of awards, including the T32, T34, T35, T37, T90, TL1, and TU2. This research will focus on the T34, T35, T37, T90, and TL1 since these are the only training-indicated grants that work with undergraduate students. Other grants that support student funding exist at the NIH. Still, often, those are more competitive (for the student), and students must apply for supplemental funding, attaching themselves to a PI's current research award.

The T34 enhances the undergraduate research experience and trains undergraduate students from underrepresented backgrounds in biomedical, behavioral, clinical, and social sciences. Training appointments are given to students who apply directly to schools and scientists who possess a T34. Funding for students may be awarded if the original grant budget dictated funding for students. The T34 functions similarly to the T32 in practice and administration but only focuses on undergraduate students versus post-doctoral students (The University of Houston, n.d.) (National Institute of Health, 2022).

A T35 operates similarly to a T34 but provides funding for undergraduate students during off-quarters of their semesters (National Institute of Health, 2022). For example, Washington University in St. Louis offers a Summer Research Award for all College of Arts and Sciences Students and a "BioSURF" program for students interested in "hard sciences." The summer undergraduate research program provides students $2,000-$4,000 based on the length and nature of their proposed research project. As part of this project, students must write and draft their budget and research narratives and work for the entirety of the summer with a designated research mentor. A T35 managed by the University funds the program. The grant and program allow students to understand better research at the university level and the administrative

components associated with university research. Students do not lack understanding once they apply for medical school or Ph.D. programs (Washington University, 2018). In the same way, the T35 supports off-quarter experiences for students; the T37 operates similarly but focuses on biomedical research for undergraduate students (The University of Houston, n.d.).

The T90 mechanism is a catch-all for undergraduate, graduate, and post-doctoral students. The grant does not focus on awarding grants to projects that focus on disadvantaged or underserved populations but does serve a broader range of students due to not having constraints on whether a project needs to be geared more towards undergraduate or graduate students (The University of Houston, n.d.). Lastly, TL1 and TL2 are considered supplements to training grants. These supplements are used to gather other required data for a research project. Still, they can be added to a training grant to enhance the scientific significance of a training grant (The University of Houston, n.d.).

Kansas has a statewide training grant in ten total schools offering undergraduate research scholarships, research mini-grants, summer research programs, conferences, student presentations, symposiums, and so much more. A 2013 study investigated the impact of this training grant on Kansas universities and found that 37% of participant respondents had entered graduate school, and 19% had gone to medical school (Chapes & Velasquez, 2013).

Previous research also showed that 32.7% of students participating in undergraduate research programs presented an academic paper with a mentor, and 67.7% presented a poster on campus. 70.5% of students in undergraduate research programs in Kansas presented at a national conference, and 45.5% had given a "talk" concerning their research, with nearly half of that also presenting a talk at a national conference. Strikingly, 27.3 % of undergraduates in the research program presented a journal article for publication.

Meaningful Employment

Research question three aimed to determine if perceptions of meaningful employment decrease or increase in positiveness depending on how much time a student spends as a researcher or participant in undergraduate research. A range of social science professionals describe meaningful employment as a health aspect of every one person's life (Oswald, 2021). To understand meaningful employment, several organizational practices need to be unpacked.

First, work must have transcendent benefits or be able to transcend the monotonous office work that often seems to have no purpose. Second, work must give opportunities for personal achievement and learning or allow a person to grow personally within their workplace. Lastly, meaningful employment will enable employees to socialize with their counterparts (Oswald, 2021). Unfortunately, most research today concerning meaningful employment focuses on well-educated white individuals, leaving little to no interpretations of what meaningful employment means for people who are not white and well-educated. Since this study focuses on perceptions of meaningful employment or meeting one's career-related goals, this research will focus on these three criteria as a description of meaningful employment.

Summary

In summary, research is complicated and multifaceted. Research can be done at many different academic levels and requires a thorough investigation to fully understand the gravity of access to research among undergraduate students. Also, while most universities cover research methods in the final year as part of a capstone, research becomes essential when considering what medical students must do as part of their research, and more importantly, if DEI initiatives are going to be advanced in American Higher Education, working with Students of Color at the beginning of their careers could benefit their knowledge of the subject areas they are studying,

and ultimately lead to more POC serving as physician-scientists (Bowman & Waite, 2003) (Adebisi, 2022)

At the beginning of a student's career, students should be assigned a research mentor as part of their program; from a more macro perspective, faculty mentoring students should be given tenure points for serving as mentors on research projects for students. The constant search that professors must endure to fund their labs leaves them needing more time and effort to search instead of mentoring in a research capacity (Adebisi, 2022).

If a student is unaware of what research is or how to be involved in research, this is a lack of communication from a top-down perspective at the University. Higher education institutions should make more effort to offer undergraduate students access to mentors, labs, and research training, both accessible and costly (Adebisi, 2022). Students should also be encouraged to participate in national learning conferences and seminars. Research shows that undergraduate students who attend conferences, collaborations, and symposia are worthwhile investments for students to gain knowledge on their intended majors and a valuable tool in teaching ways to utilize their new-found knowledge (Elicker et al., 2010).

There needs to be an investment in major research journals and capacity building in undergraduate students; essentially, research journals must invest in and support undergraduate students in their research endeavors (Elicker et al., 2010). Incentives for research participation, successes in research, and even failures in research should be more supported by federal agencies. While federal funding exists for diversity grants at an undergraduate level, those grants, mainly training grants, are highly competitive, and often, smaller research institutions miss out on training grants due to capacity issues in managing those funds.

While research shows many barriers to why students don't participate in research, there seems to be a considerable discrepancy in why students of color do not participate in research versus white students. There is also see a significant discrepancy in the number of faculty of color versus the amount of faculty reporting as white, raising the question stated earlier, "How can our professors know whom they are reaching?" and more importantly, how can the students in our higher education students trust their faculty they work with to not only teach but mentor them in research projects. With ~19,000,000 students in higher education as of 2020 and 48.4% of those students reporting stating they are students of color, that means that over nine million students are not finding proper mentorship in higher education if the deficient percent of professors of color cannot meet with and mentor every student of color (National Center for Education Statistics, 2022).

Chapter III: Methods

Overview

This dissertation aimed to understand better and examine key predictors associated with undergraduate participation in university-led research using a self-administered instrument. When comparing universities across research rankings, research participation may result from many different variables at said institutions. For example, R1 intuitions are more likely to fund research activities and time for faculty, resulting in a higher level of participation among students. As discussed previously, time, effort, and finances are a consideration for both students and faculty when considering research participation. This study was also regionally bound as participants were only surveyed in Illinois and Kentucky. This chapter will further explain why the study was bound by region and school.

Research Design

This dissertation utilized a correlational research design that attempted to determine if a variable is predictive of specific actions and behaviors associated with undergraduate research participation. This correlational research design attempted to determine the extent to which undergraduate demographics influence the positive or negative perceptions and participation in undergraduate research. A correlational design aided in examining to what extent varying levels of monetary motivations increase or decrease the likelihood of participating in undergraduate research across different demographic backgrounds. As part of a correlational design, the extent to which undergraduate research influences the perception of meaningful employment was also investigated. Lastly, this study looked at if specific tenets of Critical Race Theory are less or more predictive in determining perceptions of research participation among undergraduate students.

For this dissertation, the analysis unit was the students responding to the survey. Surveys were electronic, and students taking the survey were anonymous.

The design of the survey given to students was Cross-Sectional. According to Babbie (1990/1998), a cross-sectional survey is a survey that collects data at one point or section in time, meaning, compared to a longitudinal study design, the data is collected as a snapshot in time. While perceptions over a more extended period could benefit this study, time constraints required a cross-sectional design.

Sociometric study designs for this dissertation could yield results in the Critical Race Theory framework as a determining factor due to the lack of research participation among undergraduate students of color. According to Babbie, a sociometric study could help with interrelationships among the group of students I will be studying, leading to a way of studying certain CRT-associated factors and undergraduate research participation (Babbie, 1990/1998).

Due to time and financial constraints and some research stating sampling may be more accurate than surveying every member of a population, the sampling design used for this study was a convenience sample. A convenience sample is a sample that is garnered from respondents who are chosen or selected based on their convivence and availability (Creswell & Creswell, 2018). For the purposes of this dissertation, convenience sampling was done, utilizing university connections and dissertation committee members' access to student populations.

The study sample used was university students, and the population was defined as undergraduate students. The sampling units for this study were potentially the same as the elements (undergraduate students) but, through sample stratification, could be defined as students of different ethnical and racial backgrounds. Sociometric study designs in the future

could lead to a stratification of the sample and separate sampling units to determine other trends associated with undergraduate research and Critical Race Theory.

Undergraduate institutions that were used as part of the sampling units were Southern Illinois University Edwardsville and Murray State University in Kentucky. Both schools are considered regional R3 institutions with medium research output. For FY22, SIUE showed an awarded amount of $46,249,366 (Southern Illinois University Edwardsville, 2022), and Murray State University showed an awarded amount of $9,719,059 (Murray State University, 2022). Both universities received over 80% of their funding from federal or federal flow-through agencies.

In 2022, SIUE reported that 77% of their faculty was white and 13% were Black (Southern Illinois University Edwardsville, 7 C.E.), well above the national average of 8%, while Murray State University reported that 92% of their faculty was white, and 5% were Black, 3% below the national average of 8% (Murray State University, 2022).

Student population demographics reported show that 78% of Murray State University students reported as white and 6% as Black, while SIUE reported 68.8% as white students and 13.8% as Black students (Southern Illinois University Edwardsville, 7 C.E.).

Research Questions

Four research questions were developed to understand better perceptions and variables associated with increased research participation among undergraduate students and students of color.

RQ1: To what extent are specific demographic characteristics and other unknown variables associated with increased or decreased research participation among undergraduate students?

RQ2: To what extent does an increase in monetary motivations increase research participation among undergraduate students, and does a better understanding of research impact increase participation in research among undergraduate students?

RQ3: To what extent does research participation increase the students' perception of meaningful employment upon graduation?

RQ4: To what extent do the seven tenets of Critical Race Theory correlate in research participation among students of color?

Hypotheses

H1: A statistically significant relationship exists between demographic characteristics and other unknown variables pertaining to increased research participation among undergraduate students.

H2: There is a statistically significant relationship between monetary motivations or other factors and the number of undergraduate students who participate in research.

H3: A statistically significant correlation exists between required research participation in undergraduate programs and meaningful employment among undergraduate students.

H4: There is a relationship between Critical Race Theory and participation in undergraduate research among students of color.

Null Hypothesis

NH1: There is no statistically significant relationship between demographic characteristics and the increase or decrease of research participation among undergraduate students.

NH2: There is no statistically significant relationship between monetary rewards and the amount of self-reported undergraduate research participation.

NH3: There is no significant relationship between research participation among undergraduate students and perceived meaningful employment after graduation.

NH4: Critical Race Theory and its tenets have no relation with undergraduate research participation among students of color.

Variables

Hypothesis 1

Independent variables = Demographics of undergraduate students

Dependent variables = Hours of research participation as a participant or team member

Hypothesis 2

Independent Variable = Monetary rewards

Dependent Variable = Research experience (yes/no)

Hypothesis 3

Independent Variable = Positive and negative perceptions of future job outcomes

Dependent Variable = Experiences with undergraduate research participation (Yes/no)

Hypothesis 4

Critical Race Theory tenets are connected in some way with fewer instances of research participation among students of color.

Description of Population

This quantitative study focused on undergraduate students currently enrolled at one of two regional 4-year medium-output doctoral universities in the Midwest and Southern portions of the United States. I used points of contact or faculty members within regional universities to disseminate the study to undergraduate students within their courses. Between the two universities, a potential N-17,618 existed. I anticipated between 0.005-0.001% participation in

their study = ~88-176 participants. In the future, a more detailed analysis comprising of multiple universities across the United States will need to be conducted. Due to time constraints and access to student populations, two universities will be researched.

Participants

According to the National Student Clearinghouse, the total fall enrollment nationwide for 4-year public universities for undergraduate students is 6.1 million students (National Student Clearing House Research Center, 2023). 2.5 million students were male, 3.2 million identified as female, and over half of those identified as white. The sample of participants being utilized in this study intention was to provide a snapshot of national clearinghouse data in the Midwest and South of the United States. Participant age range varied anywhere from 17 up, with no limit on age.

Description of Instrument

For this study**,** a survey was developed to obtain more information associated with research experiences and perceptions. Please refer to Appendix Item **"C"** for a more in-depth review of the questions being asked of participants.

The survey content included five main sections to answer the four presented research questions. Sections include demographics, education, research experience, employment, and questions pertaining to attitudes and perceptions about higher education and structural racism. The researcher administered this survey via the online tool Qualtrics.

While questions were not tested for validity, study design was taken from current existing literature, including “The Survey of Undergraduate Research Experiences” and “Reflection Survey.” Both surveys were created to study the effects of undergraduate research experiences (Lopatto, 2007).

According to past research, perception of research and the idea or trust of research as seen as one of the key indicators for research participation among people of color. Including “having little understanding of who the research benefits” was a key part of survey questions inquiring why students had not participated in research previously (Carter-Edwards et al., 2002).

Time and priorities were mentioned as two of the key predictors of why students did not participate in research. Time and priorities consideration are why components of “time and availability” were included in the research survey. As high as 55.7% of students indicated “time” as a reason for not participating in research (Elicker et al., 2010). Lastly, students in other research studies indicated that having a lack of lab space or knowledge of research studies at their universities contributed to them not being a part of research studies (Adebisi, 2022), which led to the inclusion of questions concerning knowledge and awareness around research studies at the prospective students' university.

Other questions in the research instrument were demographic, to infer racial correlations with research participation, and employment, to infer correlations between research time, race, and employment opportunities. Questions around student demographics were created using the general demographics of both institutions and institutions nationwide. Demographic questions were also developed using the SURES III. Option one of the SURE III indicates “clarification of career path” and gains associated with career path knowledge. Employment questions in the constructed survey for this study were based on the “benefits” block of the SURE III.

Data Security

Data was collected anonymously using Qualtrics**,** and all information and data was password-protected on the researcher's password-protected computers. No personal or identifying information was collected from the participants of this research study. The research

only collected basic demographic information and plan of study information from the participants.

Data Analysis

The analysis of this dissertation was mostly ordinal due to the measurements collected in the administered survey being largely rank-ordered among categories comprising variables. Most ordinal measures presented were indexed with a numbering system (1-5) to infer a rank ordering system for survey questions. All of the data for the survey was collected and kept within Qualtrics, requiring little to no data entry from the study team.

According to Yockey (2011), if a researcher wants to know if a relationship exists between perceptions, race, and research participation, using the chi-square test of independence will be beneficial (Yockey, 2011). For example, using the chi-square test of independence allowed for a to testing of hypotheses 1-3 and to determine if there was a correlation between the descriptive statistics (demographics) and the hours of research participation students have, which allowed for new trends to be discovered in relation to the tenets of Critical Race Theory.

Using chi-square to test the correlation between variables also allowed for a correlation to be tested between monetary rewards and hours of research participation among undergraduate students helping to further highlight hypotheses four and two. Lastly, hypothesis three indicates positive or negative perceptions about career outlook compared to the number of undergraduate research participation experiences. Again, looking closely at these correlations allowed for broader trends to be analyzed in hypothesis four, looking at the tenets of Critical Race Theory as those tenets relate to undergraduate research participation, higher education reform, pathways to physician-scientist roles, and research science as a whole among Black faculty and students.

CHAPTER IV: FINDINGS

Introduction

Equity in research participation among undergraduate students is an important research subject that needs to be further addressed due to the potential equity outcomes between those who cannot participate in research for different reasons and those who are. As previously mentioned, undergraduate research is correlated with increased cognitive growth and creativity among undergraduate students; furthermore, those involved in undergraduate research are more likely to become physician research scientists.

The study's design used a cross-sectional survey of one slice of time in the respondents' lives. The research survey was sent out on September 15, 202,3, and closed on October 18, 2023, allowing 33 days for data collection. I had an N of 60 at the start of the survey, an N of 24 counted as non-completes, and an N of 11 that did not meet the study criteria, leaving me with an analyzable N of 24. With a minimum goal of 88 participants (0.0005% of the student population), I failed to meet my goal and achieved 68% of that minimum. The minimal amount of study participants and difficulties in recruiting could provide some face validity to the sheer difficulties in recruiting undergraduate students for research experiences.

The sample for this study included only undergraduate students from two regional medium output research universities. Requiring students to be degree-seeking undergraduate students from either Murray State University or Southern Illinois University of Edwardsville. Samples from these two universities were necessary because the IRB would be the most straightforward and time-effective given the time constraints of the dissertation. Also, the study is focused on undergraduate students regionally, and those two universities provide the study with a diverse student body of many different majors.

Research Question 1

Research question 1 addressed to what extent specific demographic characteristics and other unknown variables are associated with increased or decreased research participation among undergraduate students. Hypothesis 1 asserted that there is a statistically significant relationship between demographic characteristics and other unknown variables on increased research participation among undergraduate students. To analyze the data, Chi-Square was used in SPSS 29.0.1.

Demographics

Participants were asked to mark how they would best describe themselves regarding race. Participants were able to choose from "white," "Black or African American," "American Indian or Alaska Native," "Asian," or "other not listed." Of the 24 valid kept responses, 2 of those responses were not valid for the racial grouping, leaving a total of 22 total responses indicating race. 59.1% indicated "white," 27.3% indicated "Black or African American," 4.5% indicated "American Indian on Alaska Native" and 9.1% indicated that "Asian" best described them (see Table 1).

Table 1

Race Frequencies

		Responses		
		N	Percent	Percent of Cases
Race	White	13	59.1%	68.4%
	Black or African-American	6	27.3%	31.6%
	American Indian or Alaska Native	1	4.5%	5.3%
	Asian	2	9.1%	10.5%
Total		22	100.0%	115.8%

a. Dichotomy group tabulated at value 1.

The research instrument administered to undergraduate students asked students who had participated in research approximately how many hours those students spent in undergraduate research experiences. To understand the numbers presented below, there has to be a review of and understanding or operationalization of university research. Research is defined as being an active participant or part of a research sample on a research project (see Tables 2, 3, and 4). Per the data, white participants indicated that out of the eight that had participated in research, five stated that they had participated in research between 1-25 hours, see Table 2.

Table 2

White respondents

Count

		Race = White		Total
		0	White	
Hours in undergrad research	0-59 minutes	1	0	1
	1-25 hours	2	5	7
Total		3	5	8

Per collected data, three Black or African American students had participated in some research, while only two had participated in research between 1 and 25 hours (see Table 3). The difference between white and Black participants is not statistically significant, especially considering the number of participants that took the study compared to the demographics of undergraduate students in the United States. Per national averages, students reporting as Black at colleges and universities is ~19%, and white students are ~51% (National Center for Education Statistics, 2022). Given the racial makeup of both schools, with an average of 7.3% total Black students at each university; having three Black students total that have participated in research out of 6 total Black students is well above the expected average. Also, a total percentage of Black students,

equaling 31.6%, is well above the average percentage of Black students between both universities.

Table 3
Black/African American Respondents
Count

		Race = Black/African American		Total
		No	Black or African-American	
Hours in undergrad research	0-59 minutes	0	1	1
	1-25 hours	5	2	7
Total		5	3	8

Drawing any conclusion from the below sample (see Table 4) would be incorrect due to the number of Asian students who participated in this study, except that recruiting students of Asian descent continues to be a hardship for researchers, and more research needs to be done with students reporting as Asian.

Table 4
Asian Respondents
Count

		Race = Asian	Total
		Asian	
Hours in undergrad research	1-25 hours	1	1
Total		1	1

A Chi-Square analysis was run using the dependent variable “hours spent in research” and the independent demographic variable “race.” Because more than 20% of the cells have expected frequencies less than 5, the Chi-Square approximation is inadequate, and Fisher’s Exact Test was used to test statistical significance. Since the significance of Fisher’s Exact Test was

.375, which is above the accepted level 0.05% significance, this study has failed to reject the null hypothesis, and I cannot assume any statistical significance between the variables “race” and “hours spent researching.” (see Table 5).

Table 5
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.905[a]	1	.168		
Continuity Correction[b]	.076	1	.783		
Likelihood Ratio	2.209	1	.137		
Fisher's Exact Test				.375	.375
Linear-by-Linear Association	1.667	1	.197		
N of Valid Cases	8				

However, by using descriptive statistics, I can still see the different demographic statistics for "hours participated in research." The exact significance is true for each race indicated in this study. From this small sample size, I can see that from a very micro perspective, the research hours participated in does increase depending on race.

Research Question 2

Research question 2 asked to analyze to what extent an increase in monetary incentives increases research participation among undergraduate students and provides a better understanding of research participation's impact on undergraduate students.

To analyze monetary motivations, an answer was added to the question "Please answer why you have not participated in the research," stating "Not enough monetary compensation," which participants were sent to with conditional logic in Qualtrics after answering that they had not taken part in a research study in their undergraduate career. Survey participants were only

able to select one choice on why they have not participated in research, meaning whichever answer stood out the most to them would be the number 1 reason, and there was a statistically significant correlation of .020 between why students had not participated in research using Chi-Square Tests of Significance. A Chi-Square test was run using Independent variables “not enough monetary compensation,” Little understanding of who the research benefits,” “you have never had an opportunity to participate in research,” and “your department does not offer research opportunities.” Dependent variables for this chi-square test were “yes” and “no” to the prompt “have you ever taken part in a research study like this one or served as an active member in a research study.” Please refer to Table 6 to view the expected output of participant answers.

Table 7 shows that using Table 6 independent and dependent variables, a significance value of .020 was received, which is well below the confidence interval of .050. Because the significance value is below .050, we can assume statistical significance of the question concerning monetary motivations and reject our null hypothesis that there is no statistical relationship between monetary motivations or other factors and the participation of undergraduate students in undergraduate research. After reviewing there is also an increase among students that had not participated in research correlated with the variables associated on Table 6.

Table 6
Cross Tab

Count

		Please answer why you have not participated in research.				
		Not enough monetary compensation	Little understanding of who the research benefits	You have never had an opportunity to participate in research	Your department does not offer research opportunities	Total
Have you ever taken part in a research study like this one or served as an active team member on a research study?	Yes	0	0	2	3	5
	No	2	2	9	0	13
Total		2	2	11	3	18

Table 7

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.843[a]	3	.020
Likelihood Ratio	10.839	3	.013
Linear-by-Linear Association	4.380	1	.036
N of Valid Cases	18		

Per the literature, monetary compensation is associated with the time and availability of the student to participate in research, i.e., a student needs to be compensated for their time to meet basic needs as a student. Previous research indicated "time" as one reason students had not participated in research (Adebisi, 2022). In Table 6, my data showed that most respondents, particularly from a sample of only students from R3 (medium output) research institutions, indicated that they had not participated in research because they did not have the opportunity to.

Understanding Research

Looking at the "understanding" or "knowledge" as key independent variables influencing "opportunity" is important for understanding why undergraduate students would not participate in research if they did not have the chance to. According to the Hayek model of understanding, knowledge or understanding is deeply connected to the opportunity created by social constructs in society. According to the above table, over half of the students participating in this study indicated that they simply could not participate in research, leading to a significant gap in research knowledge according to the Hayek model of knowledge and understanding (Erikson & Korsgaard, 2016).

While monetary motivations are not the most significant contributor to why students have not participated in research, knowledge and understanding are or; opportunity and understanding are noted as the key variables to why students do not participate in research.

Research Question 3

Research question 3 investigated to what extent requiring research participation as part of a student's learning plan increased the student's perception of the likelihood of meaningful employment upon graduation. According to the literature, for work to be considered meaningful, it must have transcendent benefits or be able to transcend the office work that often feels like a means to an end versus having any real purpose to the person completing the work (Oswald, 2021). Lastly, for work to be meaningful, employment must allow employees to socialize with their counterparts (Oswald, 2021). Since most research focuses on a predominantly white and well-educated population, and the question did not have any statistical significance, this study has failed to reject the null hypothesis because there is no statistically significant correlation between working in research as an undergraduate student and perception of meaningful

employment or achieving one's career-related goals. Table 8 refers to the perception of achieving one's career goals. In Table 8, a small number of students believe that participating in research will help them in achieving their career goals. Career goals as an indicator of research success are taken directly from the SURES III and pre-research participation tests.

The survey results from this study showed that more students agreed that research improved their perception of achieving their career goals (or meaningful) employment upon graduating.

Table *8*

Count

		Do you think participating in research increases your likelihood of achieving your career goals?					Total
		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	
Have you ever taken part in a research study like this one or served as an active team member in a research study?	Yes	0	2	2	3	1	8
	No	1	2	4	4	0	11
Total		1	4	6	7	1	19

A chi-square test was run using the above variables. Perception of the likelihood of achieving career goals was the independent variable, while "yes and no" was the dependent variable. Since a significance value of .663 was achieved and is well above the .050 confidence interval, we have failed to reject the null hypothesis for Table 8. Having no statistical significance could be due to the size of the research n. Please refer to Table 9 for the Chi-square test of significance concerning the independent variable "Have you ever taken part in a research

study like this one or served as an active team member in a research study?" and dependent variables "strongly disagree-strongly agree."

Table *9*
Chi-Square Tests – meaningful employment

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.396[a]	4	.663
Likelihood Ratio	3.120	4	.538
Linear-by-Linear Association	.633	1	.426
N of Valid Cases	19		

Research Question 4

Research question 4 was intended to examine the connection between the tenets of Critical Race Theory and either the positive or negative increase or decrease in research participation by hours or by the qualitative response. As a reminder, the tenets of Critical Race Theory are Racism is Endemic, Reinterpreting the Civil Rights Movement and Subsequent Laws, Challenging Color Blindness, Whiteness as Property, Interest Convergence, Counter-storytelling, and having an Interdisciplinary Approach. For a more in-depth review of the tenets of CRT, please refer to Chapter 2, heading "Critical Race Theory" linked in the Table of Contents.

Using the responses from the research survey of respondents that identified as white, Black or African American, and Asian, I received a total of 9 responses from individuals that indicated they had participated in any research in their undergraduate programs, meaning 22 valid responses, only 41% of students have participated, and 59% had not participated in the research; which is line with more extensive studies reporting between 55.7% - 42.8% of undergraduate reporting they had not participated in undergraduate research due to various reasons (Elicker et al., 2010).

Table 10

Participation in Research

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	9	37.5	40.9	40.9
	No	13	54.2	59.1	100.0
	Total	22	91.7	100.0	
Missing	System	2	8.3		
Total		24	100.0		

Qualitative Data

The purpose of the qualitative data collection in this study was to draw on CRT trends that emerged in the personalized responses apart from the survey data collection. Seeing as how there were only six Black undergraduate students who participated in this study, there were not many responses to analyze. However, there were some interesting trends that emerged from those six responses. Of the six Black participants who submitted a qualitative response, two indicated that the only reason they had participated in research was because participating in research was required by the Psychology department. Two of the other participants indicated that they have never participated in research, and the last two indicated that they have participated in research.

Of the eight responses I received from students identifying as white, two of the eight indicated that they have no real experience in research. In contrast, the other six indicated that they were interested and had participated, but options were limited. Interestingly, when comparing the responses of Black and White students against the qualitative responses, Black students indicated at a higher rate than they had never participated in research. In contrast, White students indicated at a higher rate that they had participated in research but could not find more opportunities due to options being limited at their institutions.

The qualitative responses received fall into two major groups. The two groups were those who had participated and those who had not, and the subgroups that emerged from those responses were those who stated a lack of opportunity. Students who noted a lack of opportunity indicated that at their respective universities, they had not been made aware of research opportunities. To note, students indicating different levels of opportunity did not share other characteristics like the same major.

Critical Race Theory

Research question four focused on the correlation between the tenets of Critical Race Theory and its connection to the increase or decrease in research participation among students of color. For this study, participants were asked their race, how many hours they spent researching, and to describe their research in their own words. Unfortunately, because of the low survey turnout, only six students of color had written qualitative responses about their experiences in research. Quantitative data concerning the tenets of Critical Race Theory were present, however.

Racism is Endemic.

Previously, in the literature review portion of this dissertation, there was a discussion asserting that CRT asserts that racism is endemic, or racism is present in history and continues to be a part of societies systems and structures. Racism or the tenets of CRT are necessary for interpreting quantitative data presented in the below tenets.

Reinterpreting Civil Rights Movement and Subsequent Laws

CRT comes from legal theory, and most of the conversation around CRT started with the reimagining of laws stemming from the need to think about the white privilege associated with and the convergence of ideals mainly benefitting white people versus that of Black people (Hiraldo, 2010).

Equal education does not always mean equal access to the same types of education. The example from this research in Table 12 shows that only two Black students in this study had participated in 1-25 hours' worth of research compared to five white students; there is a disparity in access. I will address this more in the discussion chapter, but there needs to be more legislation on access to research for students of color and more knowledge and awareness.

Challenging Color Blindness and Meritocracy.

The idea of challenging color blindness and a meritocracy refers to the challenge that we are not all equal, and our different experiences mean that our challenges and experiences are vastly different (Gibbs, 2022). Looking back at the qualitative responses, Black students indicated at a higher rate that they were not aware of research opportunities, compared to white students, that indicated while opportunities were available, there simply were not enough opportunities for them to achieve their goals.

Space for Voices.

In the literature review, I discuss the non-representation of Black faculty for university students. For example, in 2016, only 7.2% of administrators were reported as Black, and then 7.9% in 2020 (College and University Professional Association for Human Resources, 2020). Faculty and administrators were combined in this analysis due to the potential that administrators could still be faculty. In 2016, 8.6% of faculty in higher education were Black. Then, in 2020, only 8.9% of faculty were Black, meaning in four years of DEI work, the number of Black faculty members only increased by 3.45% (College and University Professional Association for Human Resources, 2020).

Having space for voices, or a space for Black voices to be heard, is essential in understanding the research journey for students of varying racial backgrounds. The staggering

difference between faculty races is alarming, so much so that we cannot assume that faculty know the students they are teaching (Swartz, 2009). Data shows that out of the valid 24 respondents in this survey, only 25% were Black or African American. In 2022, SIUE reported that 77% of their faculty was white and 13% were Black (Southern Illinois University Edwardsville, 7 C.E.), well above the national average of 8%, while Murray State University reported that 92% of their faculty was white, and 5% were Black, 3% below the national average of 8% (Murray State University, 2022).

The Murray State University Fact Book shows that 78% of Murray State University students reported as white and 6% as Black (Murray State University, 2022), while SIUE reported 68.8% as White students and 13.8% as Black students (Southern Illinois University Edwardsville, 7 C.E.).

What the above demographic and faculty data mean is that this dissertation data is well above the expected participation rate of Black students, considering the dispersion of Black students at both universities.

Interest Convergence.

Interest convergence in CRT refers to the convergence of interests among different parties. Regarding CRT, this means that when the interests of other races at higher education institutions are well aligned, interests converge, and change happens (Hiraldo, 2010). Or, transversely, interest convergence can impede the progress of civil rights progress when political or policy changes benefit POC but have more benefits towards white people. Unfortunately, there was no relevant data in this study pertaining to interest convergence.

Counter-storytelling.

Counter-storytelling, or the ability of POC to tell their stories in higher education, has largely been blocked (Hiraldo, 2010). Counter-story-telling is defined in CRT as the ability to have cross-cultural dialogue in education and as a way to counter the dominant narrative rooted in whiteness.

Trust has been cited as a primary prevailing reason for inequities in research participation among students of color. Communication between different races builds a bridge of trust to conduct research or take part in research as a study sample/study participant. Counter-storytelling is essential to boarding study samples and students of color actively participating in research (Carter-Edwards et al., 2002).

As stated previously, in Space for Voices, there is a 3.6% disparity between faculty members who are Black and possibly fewer who participate in research and students who represent as Black in my study. With that in mind, knowledge and awareness of research were the number one factor as to why students had not participated in research, followed by departments not offering research, which may also come down to an awareness issue.

Interdisciplinary Approach.

All voices must be included when discussing the hierarchy and outcomes of an institution of higher learning regarding research and fixing an issue; all voices must be at the table to make a lasting change (Ejiogu et al., 2011). Again, refer to Table 6 above to see that knowledge of research, availability of research, and department advertising for research experiences are lacking in this small sample size. To scale up the ability for all voices to work together in ending racism in higher education, there needs to be more awareness of research.

Whiteness as Property.

Whiteness as property refers to historically white, well-educated people's ownership of ideas and property. Education is no different in that ownership of the curriculum, research, universities, and spaces are primarily owned by white people. In 2020, only 8.9% of faculty were Black (College and University Professional Association for Human Resources, 2020). Participation in research and mentorship from university faculty are needed to learn from teacher scientists in the research/field of medicine (Gibbs, 2022).

Null Hypothesis – Critical Race Theory

Unfortunately, while descriptive statistics helped paint a broader picture of the disparities in research and their links to the tenets of Critical Race Theory, none of the questions presented or cross-tabulated were statistically significant, so in this study, there was a failure to reject the null hypothesis.

Tenets of Critical Race Theory Importance

Research question 4 intended to determine if one tenet more than the other had a positive or negative effect on the increase or decrease of research participation among Black undergraduate students. This research primarily highlighted the negative effects of knowledge and participation, more specifically, “Space for Voices.” The interpretation of this tenant could be broad in the context of research and education and requires more research in the future; however, in this study, there was statistical significance to the question, “Why have you not participated in research?”; and, while minimal, Black students had reported at a higher rate that they did not know of or have knowledge of the research experiences available to them.

Conclusion

A small survey was used to examine the inequalities in research participation among undergraduate students at two regional universities. The data collected when running a chi-square was not statistically significant; however, descriptive statistics did show a gap in equality to accessing research, knowledge of research, and pathways to research.

CHAPTER V: CONCLUSIONS AND DISCUSSION

If we are to believe that racial disparities exist in research, then the issue of having equal representation for Black students to Black faculty could potentially create issues with Black students desiring to ascend the ranks to become PI at their research institutions. Having a lack of Black undergraduate students participating in undergraduate research simply reduces the pipeline to physician-scientist roles for POC nationally and internationally. Further discussion is needed around strategies necessary to increase Black student participation in research to bolster pipelines for Black researchers.

Discussion

The discussions below highlight what could have been different with each research question about the survey data. More importantly, the research question discussions below stress how each question could be further utilized in the future with other studies.

Research Question 1 Discussion

Research question 1 examined to what extent specific demographic characteristics, socioeconomic factors, and unknown variables are associated with increased or decreased research participation among undergraduate students. Research question 1 asked what demographic factors contribute to barriers related to undergraduate student participation in university-led research. Research question 1 helped to lay the groundwork for defining key characteristics and variables associated with research participation. Survey questions were intended to be utilized to analyze perceptions of research as a critical variable in relation to demographic factors.

While the questions presented to the students indicated a range of hours that could have been selected by the students, using a Likert scale in future studies will help increase statistical

significance and give the researcher a better idea of the disparities between students and their research participation time. Using regression for this analysis would also help the researcher find a better balance between statistical significance and usefulness of the question. Using a Likert scale to survey for hours could also help test the reliability of the variables and the question itself.

To infer statistical significance, many students must be surveyed to draw objective conclusions. Given the N, I was able to come close to matching national averages of enrollment rates among students of different races and, more importantly, the national average participation rate among Black and Asian students.

Research Question 2 Discussion

Research question 2 investigated to what extent an increase in monetary motivations increases research participation among undergraduate students and investigated if a better understanding of research impacts increased participation in research among undergraduate students. Research question two also addressed motivations, both intrinsic and extrinsic, in relation to research participation among undergraduate students.

Research question 2 addressed monetary motivations and "understanding" as critical motivations for increased participation in research. Future studies need to define "opportunity" better and its link to "understanding" to fully understand how understanding and knowledge are intertwined.

Research question 2 did yield statistical significance. Research question 2 was formulated to measure the significance of monetary and increased or decreased motivations. While the sample was not large enough to study a subgroup of respondents answering this specific question, the question's statistical significance concerning the reasons why students had not

participated in the research did yield statistical significance. Using validity testing for questions remains an essential aspect of this question, especially concerning the question, "Have you ever taken part in a research study like this one or served as an active team member on a research study? * Please answer why you have not participated in research.″

Future studies should include a more significant subgroup of participants that indicated they had not participated in research due to the significance of the question presented in this study. Qualitative methods could be used for focus groups within the subgroups to expand on the "why" research has not been a part of their college careers and, more importantly, the perceived effect of not being part of the research.

Research Question 3 Discussion

Research question 3 investigated to what extent requiring research participation as part of a university student learning plan increases the students' perception of the likelihood of meaningful employment upon graduation.

Research question three sought to provide evidence that students who had participated in research had a higher likelihood of having better perceptions of obtaining their future career goals. After review, this question requires more validity testing, and the wording needs to be changed. Students may not understand why or why not; simply would a prompt significantly increase or decrease their perception. As it stands, participating in research does not raise a positive perception of career-related goals.

While existent and grouped within the same questioning, meaningful employment must be further discussed to understand how research can affect meaningful employment or prospects and perceptions of meaningful employment upon graduation. Furthermore, discussion needs to be had on what research as a holistic learning experience can yield for undergraduate students

participating in undergraduate research. The literature review in chapter two pointed to research making students appreciate their programs and schooling experience more, leading to perceptions that research could potentially lead to more meaningful employment. The link between employment, undergraduate degree completion rates, and research must be further examined in future studies to better understand the policy implications of universities requiring research as part of a holistic learning experience.

Research Question 4 Discussion

To what extent do the seven tenets of Critical Race Theory correlate in research participation among students of color? More specifically, does one tenet more than the other four play a more significant role in increasing or decreasing research participation among students of color? As a reminder, the tenets of Critical Race Theory are Racism is Endemic, Reinterpreting the Civil Rights Movement and Subsequent Laws, Challenging Color Blindness, Whiteness as Property, Interest Convergence, Counter-storytelling, and having an Interdisciplinary Approach. For a more in-depth review of the tenets of CRT, please refer to Chapter 2, heading "Critical Race Theory" linked in the Table of Contents.

Critical Race Theory is complicated and multi-faceted. This study attempted to address all tenets of CRT and uncovered essential variables associated with increased or decreased research participation among students of color from a qualitative analysis. While giving a prompt to answer one question did not provide any statistical significance, the prompts, and qualitative questions did bring to the forefront whiteness as property and the hold that whiteness has on academia and research. Future studies should investigate not only all tenets of Critical Race Theory but, more importantly, the ones that are more relevant to research, and from this particular study, knowledge, voice, and property are at the forefront of the conversation.

Significance

Undergraduate research is significant to intersectionality because undergraduate research gives students of varying diverse backgrounds a voice and speaks about their lived experiences through their scientific endeavors. Without equality in research, society is still living under an umbrella of "whiteness as property," and students of color are not getting the experiences necessary to excel as physician-scientists.

Also, seeing as only ~8% of faculty are Black, we as a society are creating science that is not generalizable to the populations we live and work in. Science, again, should not be the property of white research, white academics, and white scientists.

Study Limitations

Some of the study limitations included but were not limited to the sample size not being as large as I had initially hoped. Not having a large sample drastically affected how the data was viewed in terms of subsamples of race and demographics.

Some survey questions left out important aspects essential to understanding the participants' responses and answering the research questions in more depth than is currently available.

Students, past and present, should have been included in this study. Not including students across all spectrums limited the sample size and hindered the data collection methodology.

Students across the aging spectrum and different types of research universities should have been pulled as part of this survey. Doing so could have aided in understanding better the “why” students do or do not participate in university lead research.

Data reported in this study is for one point in time for one specific generation of students. The study should have included students of all ages in undergraduate programs.

Future Research

Future research on the effects and disparities for students participating in undergraduate research is broad and applicable to all higher education institutions due to the potential outcomes associated with increased participation in undergraduate research per previous studies. While the null hypothesis could not be rejected for this dissertation and study due to a less than adequate response rate and small N, the response rate and answers to questions regarding whether students had participated in undergraduate research align with previous studies and larger N's. With that in mind, future studies will need to consider the validity of each question and do pre-validity testing on said questions.

Future studies should also consider a multi-level study with different subgroups and a possible experiment. For example, a restudy would be completed to gather "normal data," i.e., those who have participated and those who have not. A subgroup study would then be done with participants who had not participated in the research, and a more thorough review would be done using qualitative research and focus groups. Out of those participants who had not participated in the research, the "not participated" subgroup could be grouped into one control group and multiple other groups with different incentives to participate in fictitious research studies with varying risks and rewards. The same can be done for another subgroup of students who had participated in the research. Still, instead of being participants, those students could be given interventions of varying different types to see if participating as a study member would increase or decrease depending on the other kind of stimulus or intervention.

Future studies involving Critical Race Theory must be more thorough, and recruitment efforts must focus on recruiting primarily Black students. Research, academia, and systems of power are all affected by

Practice

While this study could not reject all of the null hypotheses included, some trends could be observed within the data collected and, more importantly, the difficulty in data collection for this particular study. While the literature consists of many reasons why university-led research is essential for undergraduate students and the disparities between those students having taken part and not taking part, there still needs to be more investigation into the macro effects of research at the undergraduate level.

Policy Recommendations

Most of the policy recommendations for this research study come from the research associated with CRT. Per CRT, there needs to be a reimagining and reinterpretation of the laws from the Civil Rights movement.

Racism is endemic, states that racism is in our systems, structures, and systems. Because of this, racism needs to be realized and analyzed within all of our systems of culture. Higher education is no different, and on a policy level, CRT needs to be a framework for analyzing how we interpret the structures of our education system.

Reinterpreting the civil rights movement and subsequent laws as a tenet of Critical Race Theory makes for an exciting policy discussion in education, especially research. Research, as a mechanism for social change globally, is a tool at the disposal of the university, and, from a federal standpoint, increasing financial spending on university research for schools often not

awarded federal aid could be potentially life-changing for many around the world, including the impact of social and medical research at a more generalizable level for all students.

Challenging color blindness and meritocracy are essential to the contribution of a policy discussion because it's easy to assume education is equal and the quality of education is distributed equally among all individuals who participate in higher education. Unfortunately, as pointed out in Chapter Two, research, in any aspect, is often impeded by little resources and funding and hinders students from being able to complete their degrees without having full-time jobs. As an education experience, research is not equally available to all, and the research in this paper shows that with little participation in this study and even fewer individuals who have been a part of the research, financial aspects contributing to equal distribution of research are not a reality. A deeper discussion needs to be had about equality in the type of education that undergraduate are getting and how research is a part of their holistic educations.

I point out that space for voices is a way for students of color to contribute to the conversation around their education and the types of education they receive. If we do not equally distribute research to undergraduate students from a federal funding perspective, the voices of students of color will not be heard. As stated in this research study, voices are defined by the trust available to them and the representation of students by faculty who look like them. Without increasing policy discussions on retention and recruitment around Black faculty members or pushing undergraduate students into research, whiteness as property will remain the status quo in our research institutions, i.e., research and our mechanisms for change through research will remain an owned product of white men.

More importantly, if we cannot converge interests in a positive way that benefits all of society through research and social change to influence research in a more generalizable way,

then we will continue to have deficits in the generalizability of our samples and the research that is being done across the world. Interest convergence, positively and politically, has to be done with an interdisciplinary approach to creating a broader impact across all political arms, which is where Structural intersectionality comes to the forefront of the political discussion. According to Crenshaw, Structural intersectionality refers to extrinsic factors of oppression that are a part of someone's identity. For example, in women that are frequently victims of rape and women of color, their structural intersectionality is often burdened by poverty, childcare responsibilities, and a lack of job skills (Crenshaw, 1991). Frequently, these forms of class oppression are mainly due to gender and class and are often compounded by race-related discrimination in employment practices against women of color. Such structural variables of intersectionality can be defined as the systems of race, gender, and class domination. For the discussion of CRT, forms of structural intersectionality are essential to remember that the lens that the data was viewed through was a lens that defines my intersectionality as a white privileged male, and the writing of this dissertation is predominantly a space for the voice of research into an inherently structural racism that exists in our systems of education. Providing an open place for discussion and using CRT as a framework for creating more space for policy discussions on research in our undergraduate students as part of allowing a

counter-storytelling narrative that can move undergraduate research equality in the correct direction.

Other points of discussion after this research are that the federal government needs to invest more in training physician-scientists of different racial backgrounds at smaller, non-R1, or R2 research institutions. There are already considerable federal funding earmarks for universities working primarily with students of color. However, this funding does not address the direct

funding and ability to educate students about research, their participation, the importance of research, and how to seek out said research experiences. As previously mentioned,

Universities/federal funders must put more effort into 1.) funding research for undergraduate students, and 2.) equipping undergraduate students at all levels of their academic careers with the knowledge, abilities, and skills associated with research. If students do not know what research is or what the positive effects of research are, then students are less likely to commit to programs that require research.

Conclusion

Research in all its facets is not equitable, generalizable, or reflective of our nation. More needs to be done to increase who has access to conduct and learn about research because universities and the federal government are currently not doing enough to create knowledge among students of color at smaller research institutions. Research institutions are not doing enough to help accelerate equality among researchers and increase the color of our campus leadership.

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Appendix A: Informed Consent Form

Study Title:

EXPLORING PERCEPTIONS AND UNVEILING BARRIERS: ACCESS TO ACADEMIC RESEARCH EXPERIENCES FOR UNDERGRADUATE STUDENTS

Investigator: Marc Kinnear

Doctoral Candidate Ed.D. P-20 and Community Leadership

(317)437-4673

Faculty Sponsor: Dr. Brian Bourke

College of Education and Human Services, Murray State University

(270)809-3588

You are being invited to participate in a survey research study conducted through **Murray State University**. As such, I am providing the following information so that you may make an informed decision on whether you would like to participate:

1.) This study aims to investigate three specific aims to understand critical predictors of undergraduate student participation in university-led research and the barriers associated with undergraduate student non-participation.
2.) Your participation is strictly voluntary, and you are free to withdraw/stop participating at any time.
3.) All of your responses will remain anonymous. (No one will know which answers are yours.) All data will be secured on a password-protected computer assigned to faculty dissertation chair Dr. Brian Bourke
4.) This survey will take approximately 20 minutes to complete.
5.) Although your responses will remain anonymous, your data/answers may be combined with the data/answers of others and submitted for presentation at conventions or in publications in scholarly journals.

6.) You will receive no direct benefits because you participated in this research study. However, your participation will help to expand our understanding of what barriers exist to research opportunities for undergraduate students.
7.) There are no foreseen risks associated with your participation in this research study.
8.) Your completion of this questionnaire indicates that you voluntarily consent to participate in this study. You are free to discontinue your participation at any time.
9.) This study will produce no generalizable data; meaning, that this study will not produce any data that can be used to make a generalized statement about a population.

THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY THE MURRAY STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD (IRB) FOR THE PROTECTION OF HUMAN SUBJECTS. ANY QUESTIONS ABOUT THE CONDUCT OF THIS PROJECT SHOULD BE BROUGHT TO THE ATTENTION OF Marc Kinnear in the Educational Studies, Leadership, and Counseling Department at (618)-691-9476, or mkinnear@murraystate.edu. ANY QUESTIONS ABOUT YOUR RIGHTS AS A RESEARCH PARTICIPANT SHOULD BE BROUGHT TO THE ATTENTION OF THE IRB COORDINATOR AT (270) 809-2916 or msu.irb@murraystate.edu.

By clicking I Agree, you acknowledge that you have read and understand the information provided, and thereby provide your informed consent to participate in this research study.

Appendix B: Study Invitation

My name is Marc Kinnear, and I am an Ed.D. student collecting data for my dissertation at Murray State University. I am writing today to invite you to participate in a study that explores the perceptions and barriers associated with access to academic research experiences for undergraduate students. The survey is anonymous and should take approximately 20 minutes to complete. If you are interested in participating in this survey, the link here will take you to a page containing more information about the survey and a link to the survey itself.

Appendix C: Survey Questions

Start of Block: Demographics

Instruction You are being invited to participate in a survey research study conducted through Murray State University. As such, I am providing the following information so that you may make an informed decision on whether you would like to participate:

This study aims to investigate three specific aims to understand critical predictors of undergraduate student participation in university-led research and the barriers associated with undergraduate student non-participation.

Your participation is strictly voluntary, and you are free to withdraw/stop participating at anytime.

If you understand that you can quit at anytime, please mark "yes."

- ○ Yes (1)
- ○ No (2)

Education Are you currently an undergraduate student seeking a degree?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If Are you currently an undergraduate student seeking a degree? = No

Education At what level of study would you consider yourself currently?

- ○ Freshman (1)
- ○ Sophomore (2)
- ○ Junior (3)
- ○ Senior (4)

Education Please state your major. If undecided, just write "undecided." For example if your major is Anthropology, just write "Anthropology."

_____

Education How are you paying for college? (Please check all that apply)

- ☐ Student Loans (1)
- ☐ Federal Grants (2)
- ☐ Parents (3)
- ☐ Scholarships (4)

Research Experience Have you ever taken part in a research study like this one or served as an active team member on a research study?

- ○ Yes (1)
- ○ No (2)

Skip To: Research Experience If Have you ever taken part in a research study like this one or served as an active team member on... = No

Research Expereince Do you currently serve as a research team member as part of a federal or state grant? For example, are you working on a NIH or NSF study?

- ○ Yes (1)
- ○ No (2)

Research Experience Do you currently serve as a research team member as part of a mentored faculty experience? For example, working with a current faculty member at your institution to assist that faculty member in their research agenda.

- ○ yes (1)
- ○ Maybe (2)
- ○ No (3)

Research Experience How many hours have you spent participating in research during your college career?

- ○ 0-59 minutes (1)
- ○ 1-25 hours (2)
- ○ 26-100 hours (3)
- ○ More than 100 hours (4)

Research Experience Please answer why you have not participated in research.

- ○ Not enough monetary compensation (1)
- ○ Little understanding of who the research benifits (2)
- ○ You don't feel safe being a part of a research study (3)
- ○ You have never had an opportunity to participate in research (4)
- ○ Your department does not offer research opportunities (5)

Gender What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Transgender Woman (3)
- ○ Transgender Man (4)
- ○ Non-Binary (5)
- ○ Agender/I don't identify with any gender (6)
- ○ Prefer not to state (7)
- ○ My gender is not listed (8)

Display This Question:

If What is your gender? = My gender is not listed

Gender My gender is ?

Age What is your age?

- ○ Under 18 (1)
- ○ 18 - 24 (2)
- ○ 25 - 34 (3)
- ○ 35 - 44 (4)
- ○ 45 - 54 (5)
- ○ 55 - 64 (6)
- ○ 65 - 74 (7)
- ○ 75 - 84 (8)
- ○ 85 or older (9)

Ethnicity1 Are you of Hispanic, Latino, or Spanish origin?

- ○ Yes (1)
- ○ No (2)

Ethnicity2 How would you describe yourself? Please select all that apply.

- ☐ White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other (6)

Education What is the highest degree or level of school you have completed?

- ○ Less than a high school diploma (1)
- ○ High school degree or equivalent (e.g. GED) (2)
- ○ Some college, no degree (3)
- ○ Associate degree (e.g. AA, AS) (4)
- ○ Bachelor's degree (e.g. BA, BS) (5)
- ○ Master's degree (e.g. MA, MS, MEd) (6)
- ○ Doctorate or professional degree (e.g. MD, DDS, PhD) (7)

Marital Status What is your marital status?

- ○ Single (never married) (1)
- ○ Married, or in a domestic partnership (2)
- ○ Widowed (3)
- ○ Divorced (4)
- ○ Separated (5)

Employment What is your current employment status?

- ○ Employed full time (40 or more hours per week) (1)
- ○ Employed part time (up to 39 hours per week) (2)
- ○ Unemployed and currently looking for work (3)
- ○ Unemployed not currently looking for work (4)
- ○ Student (5)
- ○ Retired (6)
- ○ Homemaker (7)
- ○ Self-employed (8)
- ○ Unable to work (9)

Employment Do you think participating in research increases your likelihood of achieving your career goals?

- ○ Strongly disagree (1)
- ○ Somewhat disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat agree (4)
- ○ Strongly agree (5)

Q32 In your own words, tell me about your experiences with undergraduate research.

_____

_____

_____

_____

_____

Appendix D: Murray State IRB Approval

MURRAY STATE UNIVERSITY

Institutional Review Board

328 Wells Hall
Murray, KY 42071-3318
270-809-2916• msu.irb@murraystate.edu

TO: Brain Bourke, College of Education and Human Services

FROM: Reigh Kemp, IRB Coordinator and Justin Brogan IRB Chair RK JB

DATE: 09/08/2023

RE: Human Subjects Protocol I.D. – IRB # 24-007

The IRB has completed its review of your student's Level 1 protocol entitled *Exploring Perceptions and Unveiling Barriers: access to Academic Research Experiences for Undergraduate Students*. After review and consideration, the IRB has determined that the research, as described in the protocol form, will be conducted in compliance with Murray State University guidelines for the protection of human participants.

The forms and materials that have been approved for use in this research study are attached to the email containing this letter. These are the forms and materials that must be presented to the subjects. Use of any process or forms other than those approved by the IRB will be considered misconduct in research as stated in the MSU IRB Procedures and Guidelines section 20.3.

Your stated data collection period is from 8/15/2023 to 8/14/2024.

If data collection extends beyond this period, please submit an Amendment to an Approved Protocol form detailing the new data collection period and the reason for the change.

This Level 1 approval is valid until 8/14/2024.

If data collection and analysis extends beyond this date, the research project must be reviewed as a continuation project by the IRB prior to the end of the approval period, 8/15/2024. You must reapply for IRB approval by submitting a Project Update and Closure form (available at murraystate.edu/irb). You must allow ample time for IRB processing and decision prior to your expiration date, or your research must stop until such time that IRB approval is received. If the research project is completed by the end of the approval period, then a Project Update and Closure form must be submitted for IRB review so that your protocol may be closed. It is your responsibility to submit the appropriate paperwork in a timely manner.

The protocol is approved. You may begin data collection now.

Opportunity *afforded*

murraystate.edu

Appendix E: SIUE IRB Approval

PROTOCOLS

kuali

#2222 - EXPLORING PERCEPTIONS AND UNVEILING BARRIERS: ACCESS TO ACADEMIC RESEARCH EXPERIENCES FOR UNDERGRADUATE STUDENTS

Protocol Information

Review Type	Status	Approval Date	Continuing Review Date
External Reliance	**External Reliance**	**Sep 13, 2023**	--

Expiration Date	Initial Approval Date	Initial Review Type
Sep 12, 2026	**Sep 13, 2023**	**External Reliance**

Feedback

Approval Comment

Thank you for submitting these materials to the SIUE's IRB. This project is approved to move forward. Please contact the SIUE IRB if you make any changes. Thank you!

Instructions