

An Intrinsic Case Study of Virginia Tech's College of Agriculture and Life Sciences George Washington Carver Assistantship Program: Fostering Student Success Through Culturally Engaging Campus Environments

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Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy  
In  
Agricultural Leadership and Community Education

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April 16, 2024  
Blacksburg, Virginia

Keywords: agriculture, STEM, student success, graduate education, underrepresented, underserved populations

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KELLIE V. JOHNSON

**ABSTRACT**

The pursuit of underrepresented and underserved graduate students who attend Predominantly White Institutions to pursue disciplines and careers in STEM (Science, Technology, Engineering, and Mathematics). Despite the increase in the number of underrepresented minorities in graduate school, underrepresented and underserved graduate students in STEM disciplines are encountering experiences that directly affect their graduate matriculation. This study took a case study approach to investigate the Virginia Tech George Washington Carver Assistantship Program's impact on supporting underrepresented and underserved graduate students in STEM disciplines and to assess further the extent to which their participation in this support program influences their academic and career success. Given the substantial financial resources allocated to the program and the annual student enrollment, a comprehensive case study needed to be conducted to gain deeper insight into the Carver program and the stakeholders that engaged with the program to enhance future programming and sustainability. It was essential to assess the Carver program's effectiveness in promoting student success and addressing the factors that impact underrepresented and underserved graduate students in STEM fields. Triangulation is used in this study to inform and strengthen the research findings from past program scholars, current scholars, and faculty. The Carver program is not generalizable to other programs, students, and faculty because the experiences are specific to the participants in this study. The findings illustrate that the evolution program's evolution cultivates a culturally engaging culture and climate to foster graduate student success.

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**GENERAL AUDIENCE ABSTRACT**

This study explores how a Virginia Tech College of Agriculture and Life Sciences institutional program, the George Washington Carver Assistantship Program, supports underrepresented and underserved graduate students in STEM disciplines. Despite an increase in the number of underrepresented minorities entering graduate school, these student populations faced challenges that impacted their graduate matriculation. This study utilized a case study approach to examine the impact of the Carver program on students' academic and career success. By taking a deeper look into the experiences of past program scholars, current program scholars, and faculty members, this study aims to gain deeper insight into the program's effectiveness on student success beyond supporting students through funding. While the study findings shed light on how the Carver program creates a supportive environment for graduate students, it is important to emphasize that the Carver program does not apply to all programs, students, and faculty. The experiences are specific to the participants in this study. This study highlighted that the Carver program has successfully supported students toward reaching student success by establishing a culturally engaging campus environment. Recommendations for future work in this study are to utilize a systems thinking approach to examine the program more broadly and investigate the systems in place that allow the program to function and be sustainable.

## **DEDICATION**

*In loving memory of*

*Grandma Bertha and Grandad Herbert “Pop” Jones,*

*Grandma Tommy Louis Petway,*

*My Dad Tolbert “Ami” Johnson*

## ACKNOWLEDGEMENTS

Completing my dissertation has been a marathon. I have experienced great ups and downs throughout this process, but I would not trade these experiences for anything. I will forever be proud of my accomplishment in completing my PhD. However, this journey would not have been complete without the love and support of the individuals who make up my village—people who, in some shape, form, or fashion, contributed and extended themselves to support me in various capacities throughout this process.

I would like to express my sincerest gratitude, thanks, and appreciation to the following individuals:

First, I want to thank God for being the anchor of my life. I thank God for holding me, keeping me grounded, covered, and protected. Even when I fell short of your glory, you still carried me.

To Momma, thank you for your love and support from day one. You have watched me travel to many places to reach my goals and you have been by my side every step of the way. I am forever grateful for your love and continued encouragement to go after everything I want in life.

To Dr. Tiffany A. Drape, thank you for taking a chance on me as your first PhD student. Thank you for guiding me throughout this process, allowing me to learn alongside you, and supporting me both inside and outside of the classroom.

To Dr. Chevon Thorpe, Dr. Claire K. Robbins, and Dr. Chastity Warren-English, thank you for your willingness to serve on my committee. I thank each of you for pouring into me the wisdom, knowledge, and skills that have contributed to my success.

To Dr. Randy Grayson, thank you for the wisdom you've poured into me. I thank you for being a pillar of the Carver community and Virginia Tech's College of Agriculture and Life Sciences. As the founder of the George Washington Carver Assistantship program, without your vision and persistence in developing this program, you opened the doors of opportunities for hundreds of students.

To Dr. Christopher C. Mathis, Dr. Audrey McCrary-Quarles, and Dr. William Whitaker Jr., thank you for your continued support and guidance throughout my time at South Carolina State University and continued supporters throughout my doctoral journey.

To my family and friends, thank you for your love and support in my pursuit of completing my doctoral degree. I am forever grateful to have a village with individuals like yourselves who have made sacrifices and supported me through my many sacrifices.

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## **Table of Abbreviations**

AI	Appreciative Inquiry
BGSO	Black Graduate School Organization
BIPOC	Black, Indigenous, and People of Color
CALS	College of Agriculture and Life Sciences
CECE	Culturally Engaging Campus Environments
CRT	Critical Race Theory
DEI	diversity, equity, and inclusion
GPA	Grade Point Average
GWC	George Washington Carver
HBCU	Historically Black Colleges or Universities
HSI	Hispanic Serving Institutions
IMSD	Initiative for Maximizing Student Development
IRB	Institutional Review Board
MANRRS	Minorities In Agriculture, Natural Resources, And Related Sciences
MAOP	Multicultural Academic Opportunities Program
MSI	Minority-Serving Institutions
NIFA	National Institutes of Food and Agriculture
NIH	National Institute of Health
NSBE	The National Society of Black Engineers
NSF	National Science Foundation
PWI	Predominantly White Institutions
RA	Research Assistantships

REU	Research Experiences for Undergraduate
SEM	Structural equation modeling
SOAR	Supporters of Agricultural Research
STEM	Science, Technology, Engineering, and Mathematics
TA	Teaching Assistant
TCU	Tribal Colleges and Universities
USDA	United States Department of Agriculture
VT	Virginia Tech

## Chapter 1: INTRODUCTION

The pursuit of academic and career success in the Science, Technology, Engineering, and Mathematics (STEM) fields is a common aspiration among many students working to make impactful contributions to these workforce areas. However, this pursuit is often met with challenges that disproportionately affect underrepresented and underserved individuals, building barriers toward reaching their fullest participation and success. Many underrepresented and underserved students at Predominantly White Institutions (PWIs) are developing experiences and matriculating in comparably foreign environments and thus undergo various environmental experiences (Brown, 2011; Gibau et al., 2010; Malone & Barabino, 2009, as cited in Whittaker & Montgomery, 2012). Recognizing the value and importance of diversity in STEM disciplines, institutions have become increasingly intentional, establishing programs targeted at responding to these varied needs and promoting that respond to these varied needs and promote the success of underrepresented and underserved graduate students. One such program is the George Washington Carver Assistantship Program (GWC). Also known as the Carver Program, the GWC is an institutional support program that serves underrepresented and underserved graduate students in agricultural and STEM disciplines.

Underrepresented populations in the STEM field include women of color, individuals from different racial and ethnic backgrounds such as Black, Indigenous, and People of Color (BIPOC), individuals with disabilities, and those from socioeconomically disadvantaged backgrounds (Arif et al., 2021). However, *underrepresented* in this study is defined as the representation of race and ethnicity in STEM employment and education (National Science Foundation, 2023). In addition, we use the term *underserved* to recognize those student populations that may not be racially or ethnically underrepresented but are socioeconomically

disadvantaged or have minimal access to adequate resources such as funding, low-income background, or first-generation college students. These students' needs and varied experiences can be multifaceted and present many complexities, often prompted by economic, socio-cultural, and overall institutional factors. Exploring the impact of support programs such as the Carver Program on its program scholars warrants a comprehensive and holistic approach to the exploration.

In the following sections of this paper, we will discuss the background context of underrepresentation in STEM disciplines, introduce the research questions, discuss relevant literature, describe the framework that will guide the study, the methodologies utilized, and present the remainder structure of the dissertation. Through this holistic approach and comprehensive analysis, we intended to use the Carver Program as a program model. Utilizing Carver as a guide in this exploration assisted in discussing the value and need to foster engaging campus environments that support students in their graduate matriculation through institutional support programs. In addition, institutional support programs like Carver promote the academic and future career success of underrepresented and underserved graduate students in STEM disciplines.

### **Background of Study**

College student success and persistence rates are critical concerns for the future of higher education (Lynch & Lungrin, 2018). The highest graduation rates for undergraduate students pursuing bachelor's degrees at a 4-year institution were Asian and White students (National Center for Education Statistics, 2018). Degree attainment for underrepresented and underserved populations is significantly lower than for other racial/ethnic groups. These groups include Black or African Americans, Hispanics or Latinos, American Indians, or Alaska Natives, also known as

BIPOC populations. Other racial and ethnic groups, such as White and Asian Americans, are defined as those that hold the majority status (Museus et al., 2017). These specific racial and ethnic groups predominantly make up today's academic achievement gaps. In 2019, it was reported that the rate at which the U.S. population is growing, from 36.6% to 42.2%, there is a concern about why the levels of academic achievement are significantly low among BIPOC student populations (University of New Hampshire, 2020). The achievement gap aligns with increased dropout rates toward degree attainment. The achievement gap is almost doubled at 7.2% for low socioeconomic students compared to students who fit in the middle at 3.6% and high status at 3.9% in reaching degree attainment (Bradley, 2022). According to the education attainment statistics, fewer Black and Latino/Hispanic students are pursuing higher education (Hanson, 2021). Minorities, which consist of all but those of the non-Hispanic White population, make up 37% of the United States population and are projected to rise to 57%, becoming more racially diverse by 2060 (US Census Bureau Public Information, 2012). Asian students are the highest receiving, with a completion rate of 74.9%, White students at 68.4%, Latinx at 50.3%, Native Americans at 49.5%, and Black students at 43.9% (Nietzel, 2022).

While racial disparities are often described as *achievement gaps*, many scholars now use the term *opportunity gap* instead. Achievement gaps can be caused by racism, socioeconomic status, or access to resources such as technology (Museus et al., 2017). However, opportunity gaps encompass a broader view of the various opportunities and challenges experienced by students while also including institutions and their structural systems as more active players in developing solutions (Harvard Kennedy School of Government, 2020).

The population of the United States is becoming increasingly diverse, expanding the opportunity for a more diverse workforce. We have already seen these changes in increased

multicultural and multiethnic populations in many places, specifically in the public school systems.

However, there is continued slow growth in research focused on the retention and impact on student success of underrepresented students in STEM graduate programs (Nicole & Deboer, 2020). Research acknowledges the factors influencing the retention and success of underrepresented undergraduate students in STEM programs. These factors include attitudes toward STEM, [1] Environment transitions from high school to college, [2] Sense of community and support from peers, [3] Lack of development in mentor/mentee relationships, [4] and financial support [5] (Ballen et al., 2017; Estrada et al., 2016; Kricorian et al., 2020; Nicole & Deboer, 2020; Premraj et al., 2021).

In addition, there are considerable differences in experiences between the undergraduate and graduate levels that would propose additional factors that influence academic performance (Nicole & Deboer, 2020). Other factors influencing student success at the graduate level include belonging and a sense of community [6]. Advisor-advisee relationships and support [7]. Contributions to doctoral candidacy [8]. Financial support [9]. And mental and emotional competency [10] (Butz et al., 2019; Gilar-Corbi et al., 2020; Rigler et al., 2017).

Although a limited amount of literature addresses contributing factors to graduate student retention and success, the lack of evidence warrants further investigation to address best practices for reaching the academic achievement of underrepresented graduate students in STEM. For example, studies have analyzed the distribution of financial aid and the implications of a lack of funding support. Although assistantships are a part of the financial award package, monetary awards are provided in exchange for work in research or teaching. These varied experiences could directly or indirectly impact students' graduate experiences.

Research on the underrepresentation of women in STEM fields exists. One study examined the stereotypes, culture, role models, and interests contributing to gender STEM gaps (Kahn & Ginther, 2017). It is also important to highlight that often, research focused on women and equity qualifies all women, no matter race and ethnicity, to be labeled as underrepresented. Research encompasses women of all racial and ethnic backgrounds because of the lack of female representation in the STEM field. However, although there is a lack of women in STEM, there remains an opportunity for research to examine the racial/ethnic narratives and experiences of those women in STEM who are underrepresented and underserved racially as well as socioeconomically in their right (Perkins et al., 2020; Rankin et al., 2021). Research exists on underrepresented and underserved graduate students pursuing STEM fields, specifically on underrepresented groups in STEM disciplines, such as women. However, more research is still needed to examine the impact of assistantships on the common themes affecting underrepresented and underserved student achievement and success in STEM fields.

### **George Washington Carver Assistantship Program at Virginia Tech**

Virginia Polytechnic Institute and State University is an 1862 Land grant university. The Virginia Tech George Washington Carver (GWC) Assistantship program was established by Dr. Randy Grayson, a faculty member in the College of Agriculture and Life Sciences (CAL S) and housed in the CAL S. Virginia Tech's Carver Program is a recruiting tool to encourage and support graduate students from Historically Black Colleges or Universities (HBCUs), Hispanic Serving Institutions (HSI), Tribal colleges or universities, or underserved regions such as Appalachia (Virginia Tech, 2018). The Virginia Tech Carver Program strives to support, motivate, and develop students professionally to pursue academic and industry careers in agriculture and STEM (Virginia Tech, 2018).

Virginia Tech's Carver Program is an active program that has many components. Program recruitment is done through word-of-mouth, the program directors' relationships with HBCUs and administrative leadership, and trips to minority STEM conferences. Another recruitment tool Carver utilizes is its partnership with the Historically Black Colleges and Universities/Minority-Serving Institutions (HBCU/MSI) Research Summit. Virginia Tech faculty engage with faculty and students from HBCUs/MSIs at this annual research summit through research and grant proposals. This program looks to build collaboration and foster partnerships to continue building the diversity of Virginia Tech's graduate programs.

In addition to financial support, the Carver Program offers professional development and community-building for students. Some of those events and activities include the initial program orientation/boot camp for scholars to engage with one another through community-building. Students also attend weekly professional development workshops and general body meetings for workforce and training development, such as research seminars, interdisciplinary workshops, and student-led presentations/workshops. Carver engages students through social and community-building activities, events outside program enrichment, and academic and workforce development. The social context in which they facilitate programs is often non-formal, such as the semester kick-off orientation and mid-semester activities on and off campus. The end-of-year gatherings and annual holiday events are more formal and held at the Virginia Tech Inn. Incorporating the social and community-building components into the program allows students a space to interact and engage with one another outside of the formal academic setting. Through several collaborative efforts, the Carver Program administration has created sustainable relationships with internal and external stakeholders and organizations. The goals of the Carver Program include recruiting and retaining underrepresented and underserved graduate students

who aspire to a career in higher education or the agricultural or life sciences and related science industries (Virginia Tech, 2018). Funding is critical in the program's approach to targeting underserved students. As an assistantship, students gain the experience of working in labs, teaching university-level courses, and participating in scientific research. In addition, the program provides academic and workforce training and development to increase the number of underserved students in academia studying STEM fields (Painter, 2018).

### **The Problem Statement**

Despite the increase in the number of underrepresented minority students in graduate school, underrepresented populations continue to receive fewer degrees in STEM disciplines (Carver et al., 2017). While studies have explored academic self-efficacy, academic performance, persistence, motivation, and other factors that influence underrepresented undergraduate students in STEM disciplines, there is a significant gap in the literature on institutional support programs' impact on the future success of underserved and underrepresented graduate students within STEM disciplines (Carpi et al., 2017; Hernandez et al., 2013; Williams & George-Jackson, 2014). There remains a gap in understanding the various factors that influence graduate student engagement and success in the context of these programs, which exist to support underrepresented graduate students in STEM. For these programs to be effective and sustainable, research and evaluation studies should examine students' experiences to better measure programs' effectiveness in helping students reach academic and career success.

A significant difficulty in academic research on student success is that institutions define student success by GPA, retention rates, time completion, and academic performance (York et al., 2015). This idea fails to consider the experiences and measure of success from the perspective of graduate students, specifically from the experiences of underrepresented graduate

students. Despite the increase in the number of underrepresented students in graduate school, the need for their voices to be heard is even more critical to better understand how institutions approach the systems in place to support this population of students better.

Quantitative measures have their place in making comparisons for statistical analysis, the quality of programs, and overall program analysis. However, evidence of a student's success should not solely rely on quantitative measures but also encompass qualitative measures to obtain insight into the student's world and lived experiences. How a student's experiences are defined goes beyond the fundamental formal classroom experience and includes the experiences, interactions, and environments in which the student engages outside the classroom. This is also directly related to student persistence, measured by the personal, social, and academic resources students obtain in academic environments to help leverage their academic performance and overall success despite the challenges that may present along the journey (Tinto, 2017a).

### **Purpose**

This study aimed to investigate the impact of the Carver Program in supporting underrepresented and underserved graduate students in STEM disciplines by assessing the extent to which students' participation in the program influenced their academic and career success. Given the substantial financial resources allocated to the program and the annual student enrollment, an intrinsic case study was conducted to examine the Carver program's current impact and stakeholder engagement on student success to enhance future programming and sustainability. Assessing its effectiveness in promoting student success and addressing the barriers faced by underrepresented graduate students in STEM fields was essential. Conducting a program analysis could inform the college and supporting faculty and staff of the program's impact, performance, and value to improve current and future programming based on students'

and faculty's experiences with the program. This study used a triangulation research design approach to strengthen the research findings through various angles (i.e., three participation groups). The triangulation method included semi-structured interviews with the three participant groups to guide the research process. In addition, the study utilized two theoretical frameworks; the first is the Culturally Engaging Campus Environments (CECE) Model to guide the study and present the findings, and the second framework was the Appreciative Inquiry Model (AI), which was used to take a positive approach to how you make organizational change.

### **Research Questions**

How do institutional support programs foster a culturally engaging campus environment for underrepresented and underserved graduate students in STEM disciplines toward reaching student success?

- 1) What are the experiences of George Washington Carver Assistantship Program's past graduate scholars as program participants?
- 2) How does the George Washington Carver Assistantship Program impact the success of current scholars?
- 3) What are the experiences of faculty in supporting the George Washington Carver Program scholars?

### **Positionality Statement**

Before attending Virginia Tech, I attended South Carolina State University, where I received my undergraduate and graduate degrees in Agribusiness. My experience at South Carolina State was a different experience, considering it is a Historically Black College and University (HBCU), academic support services available, financial support services, and the social environment. My experiences at South Carolina State were valuable in shaping me to be

confident in my ability to enter different professional spaces where others do not look like me, forcing me to learn how to exist outside predominantly Black spaces. I was surrounded by students and university professionals that looked like me. It never crossed my mind to think about whether I felt isolated, unsure, unsupported, or having to find community because I was surrounded by community, both personally and professionally.

As a Black woman in agriculture, seeking out individuals who had once been in my position was most important. Agriculture is a field that White males predominantly occupy; therefore, having the support of navigating the profession at an early point in my career was most important. As a young professional coming out of South Carolina State, although the academics could have been more rigorous, the knowledge and experiences gained were far more valuable. That experience has prepared me for my journey following South Carolina State University.

Fast forward to getting accepted into Virginia Tech, I knew my experience would look different than my experience at South Carolina State University. I was offered an assistantship through the Virginia Tech GWC Program. Coming into my program as a Ph.D. student, that graduate experience alone was an adjustment because the experience is more siloed; as professional students, the social experiences are different, and financially, coming from having a full-time job to a stipend was also an adjustment. As a minority graduate student, Carver gave me social, financial, and academic support to matriculate through my graduate program more smoothly. It is reasonable to assume that some of the same feelings of support I have toward the Carver program hold for other Carver scholars. By sharing insights from my personal experiences, my research uses an intrinsic case study model of the GWC Assistantship program at Virginia Tech, which fosters culturally engaging campus environments that contribute to

underrepresented and underserved STEM graduate students' success. Specifically, I conducted an intrinsic case study of the GWC Program at Virginia Tech.

### **Definition of Relevant Terms**

**Achievement Gap.** “It is the difference in academic performance across groups of students defined by race/ethnicity, socioeconomic status, and geographic location” (Karoly, 2015).

**BIPOC.** Black, Indigenous, and People of Color

**A holistic approach explores participants' unique experiences, aiming to capture the phenomena's in-depth complexity.** This approach is valuable when exploring experiences influenced by various contextual factors (Simons, 2014).

**Student success.** Kinzie and Kuh (2017) refer to “student success” as students being able to reap the benefits of their educational experiences. It is the “academic achievement, satisfaction, acquisition of skills, competencies, persistence, attainment of learning objectives, and career success” (York et al., 2015, as cited in Alyahyan & Düştegör, 2020, p.3)

**STEM** (Science, Technology, Engineering, and Mathematics) is an abbreviation commonly used as an umbrella term to group closely related connected disciplines.

**Opportunity gap.** It encompasses a broader view of the various opportunities and challenges experienced by students while also including institutions and their structural systems as more active players in developing solutions (Harvard Kennedy School of Government, 2020). It shifts attention from focusing on the outcomes to the inputs that cause the outputs (Carter & Welner, 2013).

**Underrepresented.** It is defined as a representation of race and ethnicity in STEM employment and education significantly smaller than other U.S. populations (National Science Foundation, 2023).

**Underserved.** It is defined as populations that are socially and economically disadvantaged or lack access to resources (Wu et al., 2023).

### **Summary**

This research aimed to explore the George Washington Carver Assistantship Program through culturally responsive approaches and its impact on student success. This chapter first provided the situational significance of the study and an in-depth overview of the program. From there, it further discussed the need for universities to explore other strategies for measuring student success, explicitly examining student success from the perspective of underserved and underrepresented graduate student populations. Finally, it discussed the overall purpose and research questions guiding the study.

## **Chapter 2: LITERATURE REVIEW**

### **Higher Education**

Many would argue that the purpose of higher education is to assist students in building the necessary skills and knowledge needed to succeed in their chosen field of work (Chan, 2016; Nora & Crisp, 2007; Thomas, 2012). On the other hand, they would argue that higher education should work to make the most significant contributions to society (Chan, 2016). For higher education to remain on the path of enhancing economic opportunity and contributing to the commonwealth of society, it is critical to recognize and address the challenges and opportunities of advancing postsecondary DEI (Schak, 2016). Higher education is an ecosystem of complexity, from policy, law, geography, culture, human behavior, values, vision, and beliefs. Each of these components directly or indirectly influences aspects of the institution, from the campus environment, resources, teaching and learning, formal and informal programming, faculty, staff, and most importantly, the students. The university system has evolved and undergone several changes to improve campus environments and academic programs. Additionally, there are initiatives to address access and equity for underserved and socioeconomically disadvantaged students.

Before the reconstruction of education, the segregated system was deconstructed, which prevented equitable access to educational resources. These events include the Morrill Act of 1862, the Second Morrill Act of 1890, Plessy v. Ferguson (1896), Brown V. Topeka Board of Education 1954, and the Civil Rights Act of 1964 (Litolff, III, 2007). The United States has been working to mitigate discrimination through legislation. However, issues related to racism and systemic discrimination in higher education are still relevant and present today, from structural inequalities to disparities in resource allocation and meeting underserved students' evolving

needs (Jones & Nichols, 2020). Historically, race has been and continues to be a critical issue in higher education and society (Parker, 2003).

## **Desegregation of Education**

### ***Morrill Act of 1862***

Up until 1867, anti-literacy laws were put into Act which prohibited Black Americans, both enslaved and some free, from access to education. Considering the racial disparities and oppressive systems in place against Black Americans during that time, access to higher education was not an option. America thrived on the laws that permitted racial segregation in public places, from restaurants, churches, schools, and restrooms. This activity was most prevalent in the South. The desegregation litigation process began immediately following the Civil War in 1862 with the establishment of the First Morrill Act (Stefkovich & Leas, 1994). The First Morrill Act of 1862 opened a door that would begin a journey toward access for all in education. Senator Justin Morrill of Vermont sponsored the First Morrill Act, and President Abraham Lincoln signed it into law in 1862.

The Act established publicly funded colleges by developing and selling federal lands (National Archives, 2022). Over 10 million acres of land provided by federal government grants were seized from tribal lands of various Native communities, but that did not stop the development of these institutions (National Archives, 2022). The Act supported one institution in each state by granting each state 30,000 acres distributed by each senator and representative (Act of 1862). In addition, it emphasized the agricultural and mechanical arts, creating opportunities for middle and lower-class working people excluded from higher education (Teddlie & Freeman, 2002). It is also important to note that Lincoln signed the Act before the Emancipation Proclamation; therefore, it did not address the needs of Blacks at the time.

### ***Second Morrill Act of 1890***

It was not until 1890 that the Second Morrill Act, signed by President Benjamin Harrison and sponsored by Senator Justin Morrill, was established. The Second Act was aimed at the Confederate states of the South to address discrimination issues (National Archives, 2022). It forced the states to establish a second land grant to expand the opportunities and access to higher education for people of color (McPartland, 1978; Stefkovich & Leas, 1994). In addition, the Act prohibited discrimination in the admission policies of universities receiving funding (Croft, 2019). However, it still permitted these states to establish the requirement “of like character” for White and non-White students (Kalb, 2022; Teddlie & Freeman, 2002).

### ***Plessy vs. Ferguson***

Following the Land grant system and its institutions, the government overruled Plessy v. Ferguson by racial segregation under the doctrine of “separate-but-equal” (Locke, 1951, pp. 66-72). The case derived from an incident in 1892 where a Black train passenger named Homer Plessy refused to sit in a train car designated for Black passengers. The Supreme Court case upheld the principle of racial discrimination that “separate-but-equal” facilities were constitutional (National Archives, 2022). Although Plessy v. Ferguson was not a case about education, the ramifications were critical factors in the segregation and, thirty-plus years later, desegregation of the education system (Woodley & Figiel, 2004).

### ***1954 Brown vs. Topeka Board of Education***

The 1954 Brown v. Topeka Board of Education case ruled that separating children in public schools based on race was unconstitutional (López & Burciaga, 2014; Brown v. Board of Education (1954), 2021). They ruled that state-sanctioned segregation of public schools was unconstitutional because it violated the 14th Amendment (Woodley & Figiel, 2004). During this

time, there were numerous cases of Black students bringing their issues to the legal system and suing for the right to attend colleges of their choice (Orfield & Lee, 2006). The Brown v. Topeka Board of Education cases ended racial segregation of schools in the United States. The Supreme Court also overturned the “separate-but-equal” doctrine from Plessy v. Ferguson (Woodley & Figiel, 2004, p. 3).

### ***Civil Rights Act of 1964***

The enactment of the Civil Rights Act of 1964 guaranteed the legal statute that ensured desegregation (Litolff, 2007). This era marked the start of presidential policy addressing racial inequalities throughout the nation’s systems. Title VI, Civil Rights Act of 1964 states that “No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or subjected to discrimination under any program or activity receiving federal financial assistance” (United States Department of Labor, n.d.). Still, today, the implementation of this law continues to lead in many cases to litigation.

### ***Equity in Education Land Grant Status Act of 1994***

After 100 years of the established Morrill Act of 1890, the Equity in Educational Land Grant Status Act 1994 established the Tribal Colleges and Universities (TCUs) (Croft, 2019). As a result, the Native American Institutions Endowment Fund was created and distributed annually to these universities (National Archives, 2022). An endowment is a collective of assets invested in colleges and universities to support education and research (Croft, 2019). Institutions can utilize endowment funds at their discretion (National Institute of Food and

Agriculture, 2022). Today, there are 111 Land grant institutions, of which 19 are HBCUs and 33 are TCUs (National Education Association, 2022).

Society has seen decades of evolution and change in the education system, but the opportunity gap between White and minoritized students remains visible. The National Center for Education Statistics reorganized the percentage distribution of degrees conferred in the United States by race. The data indicated that since 2018, there has been a decline among the majority, and the gap widened in degree attainment for Black, Hispanic, Asian Pacific, and American Indian/Alaska Native students. White students decreased from 61% to 59.1% from 2018 to 2020 across all degrees conferred; Latinx/Hispanic students decreased from 14.8% to 13.1%; Black students declined from 11.3% to 11%; Asian/ Pacific Islander students decreased in graduates from 8.7% to 6.6%; and American Indian/Alaska Native students increased in graduates from .5% to .6% (Hanson, 2021). In addition, the American Council on Education (2017) found that of all master's degree recipients, 50.9% were White, and 25.5% were students of color. Of doctoral students and students with professional degrees, 56% were White and 25.9% were people of color (Taylor et al., 2020).

The United States higher education systems institutions have collectively improved their graduation and retention rates for underrepresented and underserved groups (Hanson, 2021). However, institutions still fail to provide program interventions and support to increase degree attainment among these underrepresented groups. Demographic shifts, increased expectations of students, ongoing advancements in technology, and the demand from the state and federal levels for improved recruitment and retention are pushing the need for more improvements across higher education (Furst-Bowe, 2011). There remain challenges of resource allocation, financial

inequities, quality, efficiency, and effectiveness of systems and programs that need attention to experience the long-term viability of a more diversified economy.

### **The Role of DEI-Funded Program Initiatives**

The STEM field has continuously evolved and grown since the Industrial Revolution. Since then, there has been a growing need for minorities to enter STEM careers. Increasing the diversity of the field not only diversifies the talent but is essential in developing a more globalized economy (Guess, 2008; Moore, 2006; Öztürk, 2007, as cited in Palmer et al., 2010). Institutions are shifting to foster more diversity among students, faculty, and university staff, which can positively impact economic development. Considering the United States Census Bureau's (2020) population projection, the minority population can expect to become more racially and ethnically diverse between the years 2020 to 2060. The Census projects that the non-Hispanic White population will decrease tremendously over the next few decades, even with an increase in the U.S. population (Vespa et al., 2018).

Institutions must acknowledge the programmatic need for STEM initiatives and interventions that promote and support underserved and underserved students. The number of underserved women, racial minorities, socioeconomically disadvantaged, and first-generation students in STEM represents the lack of concern for human capital development (Rincon & George-Jackson, 2014). Groups such as the Committee on Equal Opportunities in Science and Engineering and the Committee on Underserved have expressed concerns for DEI, scientific advancement, and workforce preparedness (Institution of Medicine, 2011). In addition, other entities expressed concern about addressing the importance of developing student competency in STEM to meet the economic needs of the nation and the workforce (Carnevale et al., 2011). Kanny et al. (2014) found that research on DEI in STEM fields still needs to address solving

issues around representation. A more diversified STEM field requires continued work and research into developing diversity-driven and focused STEM programs (Palid et al., 2023; Palmer et al., 2010;).

There are apparent gaps in the research and praxis of supporting minority students in STEM programs. However, as a response to encourage STEM persistence among underserved students, some institutions are beginning to develop programs dedicated to training and developing students toward degree completion and STEM-related careers (Palid et al., 2023). Some explicit factors correlate with the successful outcomes of these diversity-focused STEM programs.

Despite the growing need for more STEM interventions and initiatives, external and internal university entities have developed and implemented a range of initiatives to support underrepresented and underserved students pursuing STEM degrees (George et al., 2019; Ghazzawi et al., 2023; Palid et al., 2023; Palmer et al., 2010). These programs are effective because they address the financial barriers preventing students from completing their studies. However, programs that aim to serve individuals or cohorts of underrepresented and underserved students should have multifaceted systems and diverse services and processes to support and develop their students (Palid et al., 2023). In many cases, national programs such as the National Science Foundation (NSF), the National Institute of Food and Agriculture (NIFA), and the National Institute of Health (NIH) provide leadership and funding to universities to develop programs that advance STEM and agriculture (USDA NIFA, 2023).

#### ***National Science Foundation (NSF)***

The purpose of NSF is to advance the non-medical field of STEM through funding projects and program proposals for research and education (National Science Foundation, 2023).

Since 1952, the National Science Foundation has appointed over 46,000 graduate students to receive graduate research fellowships (NSF, 2023). The graduate research fellowship program is the country's oldest graduate program in STEM and related sciences. When universities produced valuable research in exchange for government funding, NSF aimed to develop research, support programs, enhance the relationships between the institution and government relations, and increase the number of professionals entering the STEM and related sciences workforce (Goldsmith & Presley, 1999).

### ***National Institutes of Food and Agriculture (NIFA)***

As for NIFA, it is a United States anchor for supporting research, education, and extension programs (National Institute of Food and Agriculture, 2022). NIFA strives to enhance the DEI of agriculture and sciences that impact United States Agriculture today (National Institute of Food and Agriculture, 2022). In addition, NIFA acknowledges the collaborative efforts with domestic and international partners to promote global competence and grow the nation's AG-STEM workforce (National Institute of Food and Agriculture, 2022). Lastly, NIH is the United States medical research agency. They support scientific research and education by funding university programs and initiatives to increase underrepresentation in health sciences (NSF, 2022; Virginia Tech, 2022). Many of the programs funded through more extensive nationally known government programs like NIFA, NSF, and NIH allow for endless opportunities for universities to continue making strides toward enhancing the nation's economic development.

### ***Initiative for Maximizing Student Development (IMSD)***

National program funds are from agencies like NSF, NIFA, and NIH support programs, such as the Virginia Tech IMSD training program. IMSD works to enhance the number of

underserved graduate students in the biomedical and behavioral sciences and engineering who want to pursue a career in biomedical research (Virginia Tech, 2022). The IMSD program is intentional in its efforts to foster a space of community, mentorship, and networking as students matriculate through their graduate studies (Virginia Tech, 2022). IMSD also provides financial support through partnerships with university departments to foster collaboration across the university (Virginia Tech, 2022).

### ***Houston-Louis Stokes Alliance for Minority Participation (H-LSAMP)***

The Houston-Louis Stokes Alliance for Minority Participation (H-LSAMP). H-LSAMP is a National Science Foundation-funded program serving MSI, such as HBCUs and HSIs, since 1998 (Ghazzawi et al., 2023). They strive to address racial barriers to produce more STEM degrees. Through research, H-LSAMP found a gap in the work to address opportunity gaps within the STEM field. The program identified that students' two most pertinent needs are academic and financial support. Regarding this comprehensive study, it is essential to highlight that the H-LSAMP is not a graduate program but a program that supports high school students transitioning to bachelor's degrees in STEM (Ghazzawi et al., 2023).

Universities have a critical role in fostering, supporting, and promoting efforts that improve and expand the contributions to drive economic progress. In addition, the drive for economic progress also includes an increase in diverse representation, whether race/ethnicity, gender, age, or background. A more diverse workforce brings many ideas, perspectives, and skills. Which, in return, can enhance productivity, foster innovation, and develop a highly skilled workforce. Additionally, programs can propose additional funding contingent on their record of program planning, delivery, and impact. These various programs consider program impact based on the ask of the funding agency and whether programs have met the program's needs.

Examining those programs is valuable in helping justify the aspects of the program. However, opportunities remain to approach program impact holistically (Wilkinson & Tweed, 2018).

Examining program impact from a holistic lens is essential and valuable in investigating the effect or influence of the program on its participants. Still, they can be significantly limiting in establishing a broader examination of a particular program or intervention (DePass & Chubin, 2008). Therefore, the programmatic aspect was often acknowledged considering research examining graduate programs for underrepresented and underserved graduate students. However, they failed to use a more holistic approach to addressing the factors or barriers that directly impact the individual student's academic experience and how those factors can impact the overall program. This is vital for institutions because, as discussed above, collectively, institutions are becoming more intentional about developing support programs in the context of PWIs. However, they do not consider how these programs are structured and implemented in a way that considers the individual and unique experiences of these underrepresented and underserved students who navigate these academic programs and institutions as participants of these support programs.

### **Institutional Intervention and Support Programs**

Institutions have adopted George Washington Carver for various assistantships, fellowships, scholarships, or internship programs that recruit and retain students who identify as underserved or underserved minority students (Valverde, 2003; Virginia Tech, 2018). They each present their uniqueness and value for recruiting minoritized students to enter the fields of STEM. Carver and Carver-like programs were established at 1862 Land Grant universities to serve underrepresented and underserved populations. These programs create space and provide resources for populations not the majority population at the institution. GWC funding Is not a

standard national program that universities can apply to receive these funds. Funding sources are specific to that specific university and program. These programs are structured and designed based on the needs of that university and department. The program funds are left to be managed by that institution. For example, the Virginia Tech Carver Program is funded through the College of Agriculture and Life Sciences (CAL S) deanship. The Dean's office curates a fixed budget from various resources. Administrators under the CAL S come together and agree on the budget. From there, departments work together to match funds with the Carver program to support Carver scholars.

### ***Iowa State University GWC Scholarship Program***

Iowa State University's GWC scholarship program exemplifies this program's correlation. Iowa State is also an 1862 Land grant University in Ames, Iowa. The Iowa State GWC is neither an assistantship nor a fellowship program, but instead, a scholarship program that awards one hundred full-tuition scholarships to incoming minority undergraduate students. Students must identify as American Indian or Alaskan Native, African-American, Pacific Islander, Desi American, Hispanic or Latino/a/x, or multi-racial. In addition, students must graduate from high school to qualify for the funding. The scholarship is renewable for an additional year, considering the four years needed to complete an undergraduate program (Iowa State University Learning Communities, 2023).

Funding is one component of the Iowa State GWC scholarship program. Scholars are also required to register and participate in The Carver Academy. The Carver Academy works as a tool to enhance, encourage, and support its scholars through academic, social, and cultural activities throughout their program matriculation. The Iowa GWC scholarship aims to promote learning, achievement, and integrity through two required University Studies courses (Iowa State

University Learning Communities, 2023). These program-specific related courses assist scholars in their adjustment to campus and student life at Iowa State. Through engagement with faculty and peers, these courses also aim to enhance scholars' social and leadership skills to develop an understanding and appreciation for DEI (Iowa State University Learning Communities, 2023).

This program also provides resources that support GWC scholars through Academic Outreach. Academic Outreach services include free tutoring, advising, and directing students to other student support services around campus (Iowa State University Learning Communities, 2023). Personal Crisis Intervention supports students with mental health resources through challenging situations inside and outside the classroom. In addition, scholars can participate in on campus involvement activities (Iowa State University Learning Communities, 2023). Other resources for scholars through The Carver Academy are professional development funds; scholars can request funds to support professional development interests. Lastly, The Carver Academy offers Career Exploration events where it partners with career services to facilitate professional development workshops to assist students in their future careers, interests, and explorations following their undergraduate studies.

### ***Purdue University GWC Fellowship Program***

Next is the 1862 land grant, Purdue University, located in West Lafayette, Indiana. Purdue's GWC Fellowship program is like Virginia Tech's Carver Program regarding its foundational vision and mission: to enhance the diversity of student populations in STEM fields. Purdue's GWC Fellowship started in 2001 when the graduate school awarded its first GWC fellowship award (Purdue University, 2023). Departments nominate prospective students who meet program requirements (Purdue University, 2023). Fellowships are for doctoral-seeking students who attended either of the MSIs and exemplified superior academic performance and

abilities. Fellows must also aspire to a career in the professoriate. The program provides two students with financial support from the graduate school, \$35,000 per year for five years (Purdue University, 2023).

The GWC can support ten students simultaneously as they enter and leave their programs (Fellowship Operations Administrator, personal communication, March 1, 2023). In addition, as part of the recruitment strategy, Purdue developed the Historically Black Visitation Program, which would allow students to pipeline into graduate programs. This program aims to support and motivate underserved students from MSI to pursue graduate studies at Purdue University (Purdue University, 2023). Students participate in a campus tour and meet with administrators, faculty, staff, and students from their program of interest. Finally, Purdue's GWC Fellowship is still an active program and does not have a programmatic component. The fellowship solely supports students through financial aid (Purdue University, 2023).

### ***The University of Missouri GWC Matching Assistantship***

The University of Missouri is in Columbia, Missouri—the University of Missouri George Washington Carver Matching Assistantship Program. The assistantship honors GWC, a native of Missouri. The Missouri Carver Program targets first-year underserved graduate students pursuing master's and doctoral degrees in STEM fields (Missouri College of Agriculture, Food, and Natural Resources, 2022). The assistantship provides \$11,000 per master fellow and \$12,500 for doctoral fellows. A key program component in the conditions for funding is that there must be a Divisional/Departmental or grant-based assistantship program to match the GWC funds. Master's students receive two years of funding, and doctoral students receive three years of funding with consideration of an extension based on academic progress toward completion of the degree (Missouri College of Agriculture, Food, and Natural Resources, 2022). The programs

provide an additional stipend that advisors can utilize to support the student in formal or informal academic enhancement activities.

The Missouri Carver Program averages 2-3 fellows an academic year. They have never had any research or evaluation conducted to examine the effectiveness of this program on student success and academic achievement. The program has documentation of feedback from previous fellows who shared their need for funding. The program participants did not share structured program experiences (Missouri College of Agriculture, Food, and Natural Resources, 2022). However, students shared their gratitude for their acceptance and financial support (Missouri College of Agriculture, Food, and Natural Resources, 2022).

### ***The University of Arkansas GWC Project***

The fourth Carver Program discussed in this study is the University of Arkansas, George Washington Carver Project (Wolff & Nickel, 2002). Located in Fayetteville, Arkansas, the University of Arkansas GWC Project was implemented in 1997 to establish a collaborative partnership with HBCUs and Hispanic Serving Institutions (HSIs). Foundationally, like other Carver Programs, program efforts were to increase the diversity of the university's student body (Wolff & Nickel, 2002). The Carver Project was a program site under the Research Experiences for Undergraduate (REU) programs, supported by the United States NSF. The Carver project aimed to enhance diversity by recruiting and retaining undergraduate students from HBCUs and HSIs to pursue graduate and professional degrees at the University of Arkansas (Wolff & Nickel, 2002).

Funding for each participant would come from matched funds through the college and department (Director of Graduate Fellowships, personal communication, March 1, 2023). Students would spend 6-8 weeks on campus participating in faculty and graduate student-led

programming, workshops, and research. The program provided students with meals, stipends, and housing (Director of Graduate Fellowships, personal communication, March 1, 2023). In addition, as a program incentive, students received a credit on their transcripts. The Carver Project ended six years ago (Director of Graduate Fellowships, personal communication, March 1, 2023).

Even after the program's closing, the University of Arkansas's relationship with the MSIs has continually developed through various collaborative efforts (Director of Graduate Fellowships, personal communication, March 1, 2023). However, their retention strategies to pipeline program participants into graduate and professional programs were unsuccessful (Director of Graduate Fellowships, personal communication, March 1, 2023). They saw little to no return on students interested in their graduate programs (Director of Graduate Fellowships, personal communication, March 1, 2023). These same and similar Carver Programs are only a fraction of programs and initiatives designed to recruit and retain underserved scholars into STEM graduate degree programs. These historically White institutions and programs are reshaping the diversity in STEM fields. The work has evolved in the mission to ensure that diversity, equity, and inclusivity efforts are implemented in their programs to better train and develop students for the workforce. However, gaps remain in the research on how programs measure or assess the impact of these programs through a holistic lens—going beyond core academics to develop an understanding of the “big picture” (Traill & Traphagen, 2015).

### **Student Success**

Some studies have defined student success through test scores, a one-dimensional quantitative measure (Weatherton & Schussler, 2022; York et al., 2015). Few studies have incorporated qualitative methods, such as subjective well-being, to measure success (Castro et

al., 2011; Fisher et al., 2019, as cited in Weatherton & Schussler, 2022). According to Weatherton and Schussler (2022), a study measured student success through quantitative and qualitative methods to capture the best pathways to academic achievement of underserved graduate students in STEM. However, the field is still developing a distinctive view of success by intersecting quantitative and qualitative methods and expanding the underrepresented and underserved populations it examines. Student success through the students' authentic voice is still overlooked and underheard. Furthermore, they should be examined more thoroughly in the context of where and how these program interventions support students because it is essential for the students, as well as the program's development, structure, and sustainability.

Population diversification in the United States is steadily increasing. This drastic change in growth permits an expansion and development of academic support to ensure growth in student success and retention (Ashton-Hay & Doncaster, 2021). Data suggest that attrition rates among graduate students in Ph.D. programs and other professional fields exist for varied reasons: training and development/contributions toward degree attainment, mentor/mentee or advisor/advisee relationships, lack of knowledge of mental health resources; increasing expenses, and lack of community (Chrzanowski & Poudyal, 2019; Maher & Macallister, 2013; Rigler et al., 2017). Golde (2005) explored the role of the department and discipline of high attrition on doctoral students and found that the topic of attrition on graduate students, specifically at the doctoral level, is highly overlooked and understood. High attrition may be contingent on more than just the student's performance but on the role of the department, university, or specific study area. There is the economic and noneconomic cost of being in the program, such as waste of resources, whether departmental or institutional, and the social and emotional costs to students, faculty, and students to peers.

Beyond the general evidence on the high attrition of underserved students, this concept is even more applicable for investigating the attrition of graduate students in STEM fields. Although there is little evidence, the racial and ethnic gaps in STEM degree attainment remain. While many studies examine attrition of minority undergraduate students in STEM, Sowell et al. (2015) completed a Doctoral Initiative study on minority students in STEM. They found that underserved graduate students participating in doctoral STEM programs are disproportionately lower than White students. As a result, these program outcomes directly affect the workforce. For example, Hispanics comprise only 8% of the STEM workforce, and Black workers comprise only 9% of the STEM workforce (Fry et al., 2021). Asians are overrepresented in the STEM workforce, earning 70% of bachelor's, master's, and doctorate degrees, and White students attained 76% of all research doctoral degrees (Fry et al., 2021).

### ***The Role of Graduate Funding on Student Success***

Graduate funding can come from multiple sources: teaching assistantships (Tas), research assistantships (RAs), and fellowships. These sources can look different based on the institution, program, and scope of work. They also encompass different mechanisms producing similar outcomes (Knight et al., 2018). Acknowledging that the Carver Program is an assistantship program, not a fellowship program, is essential. Scholars enrolled in the program can work as Tas, which allows qualified students to assist a faculty member with instructional teaching and learning responsibilities (Luft et al., 2004).

On the other hand, students can also participate in RAs; this constitutes an arrangement in which graduate students receive financial support to conduct research under a senior researcher or faculty (West Virginia University, 2022). RAs have emerged as a research practice that fosters new and innovative ways of enhancing communication among communities of research,

interdisciplinary sectors of collaboration, and the communication of science inside the communities of non-researchers (Marbach-Ad & Marr, 2018; Niemczyk, 2015). For the Virginia Tech Carver Program, in some cases, students have both RA and TA appointments. However, the Carver Program does not make these assignments. Instead, the student's advisor makes the assignments. As graduate students and potential researchers, this knowledge and skill set should be developed throughout the graduate school experience.

Student development, knowledge, and skill transfer are essential in preparing future researchers (Peng et al., 2021). The skills developed work concurrently in focusing on learning research, such as a research assistantship, allowing students to engage with their peers, faculty, and hands-on research. Also, RAs help in degree progression and completion and students' overall academic progress.

Funding is an aspect of graduate school that can positively or negatively impact students' overall experiences. Literature shows that access to reliable financial resources and support significantly impacts program completion and students' ability to engage in academic program activities (Coe-Nesbitt et al., 2021). Fellowships are structurally not designed to establish space for community and networking with peers and professionals but instead provide financial support (Freeman, 2005; Goldsmith & Presley, 1999). Fellowships usually cover all student expenses and often have no work requirements (Mendoza et al., 2014). Assistantships, however, allow students to exercise their academic involvement through tasks with advisors and peers, which are critical components in graduate retention (Gardner & Barnes, 2007). The socialization aspect of assistantships has a significant impact on retention.

## ***The Role of Community in Student Success***

Graduate programs in the United States have built fellowship programs that focus on attracting a more diverse student body (Schak, 2016). Building a community in graduate school, especially for an underserved student, is critical for student degree progress and academic achievement (Walsh et al., 2021). 1862 Land grant institutions are occupied by predominantly White students, limiting the number of minority students who must engage with other minority students. Institutions and their DEI-funded initiatives and programs are significant in fostering community-building spaces, allowing students to connect with other students and professionals. Community-building also allows students more support and mentorship toward personal, professional, and academic progression (Venkatesh et al., 2021).

The ability of students to perform at an elevated level academically is what is expected of them to attain a degree. However, a personal and professional community of healthy and supportive relationships is also essential (Nettles & Millett, 2006; Johns et al., 2019; Tinto, 2017a). Various forms of support inside and outside the university can assist graduate students in reaching success and degree attainment. Because of the rigor of graduate programs, research, and workloads, the balance between academic and personal support fosters a well-rounded experience for the student (Coe-Nesbitt et al., 2021). While STEM programs' content and research skills are paramount for training graduate students to enter the workforce, their professional communities should also measure students' success (Venkatesh et al., 2021).

### **Conceptual Framework**

This study utilized two theoretical frameworks to guide this work. The first theoretical framework utilized the nine CECE indicators and the four stages of the AI model. The conceptual framework in Figure 2 is illustrated by a flower, which shows how both the CECE

and AI models were utilized in the study. The burgundy centermost part of the flower illustrates the nine CECE indicators. The nine indicators were represented in each of the AI model phases. The *Discovery* and *dream* stages were participant-led. This means that in each of those phases, the participants' participation emerged the most from talking about their experiences. The *delivery* and *design* stages were researcher-led. The researcher's positions emerged most, as their position was to collect, compile, and make meaning from the participant's responses from the Discovery and dream stage.

### **Theoretical Framework**

#### ***Figure 1***

#### ***Culturally Engaging Campus Environments Model***

#### ***Culturally Engaging Campus Environments (CECE) Model History***

The CECE Theoretical Framework originates from Tinto's student integration theory (Museus, 2014a). The theory of student integration was the leading model used around student achievement in higher education (Museus et al., 2017). The CECE Model is derived from thirty-plus years of research on higher education and student success (Museus et al., 2011). Derived from having challenged Tinto's Theory of Student Integration, a theory that took a Western White lens to examine student success in higher education (Azevedo et al., 2017), Museus took a different approach to examine student success more in-depth to the experiences of diverse student populations. He accomplished this by developing a framework that assessed the campus elements that affect the experiences and outcomes of diverse racial/ethnic demographics of student populations in higher education. The research to support the model consisted of various qualitative studies of over 180 interviews and multiple quantitative analyses (Museus, 2014a).

These studies examined the experiences and outcomes of diverse racial/ethnic student populations (National Institute for Transformation & Equity, n.d.).

In education, studies have used theories such as critical race theory (CRT) as a mechanism to understand, critique, and uproot racism on an institutional level (Ladson-Billings, 1998). Researchers have also used the theory of human capital, which proposes that students in higher education make decisions based on the costs and benefits of their options (Melguizo, 2011). While this type of cost-benefit analysis is common among racially minoritized students, students' ability to pay for school through financial aid (i.e., grants, scholarships) and employment (i.e., campus work-study) does influence the success of racially diverse students in the STEM fields (Museus, 2014a).

With the increase in minority students attending PWIs, it is essential to emphasize that racially minoritized students' lack of connection to campus culture impacts them psychologically (Schak, 2016). When they interact and engage in similar ways as White students, whether with faculty, staff, or peers, racially minoritized students' experiences are more adverse than their White counterparts (Harwood et al., 2012). These experiences are critical in understanding student success. Scholars have worked to develop many concepts to address using a more culturally conscious lens to view student success (Museus et al., 2017; Rendón et al., 2000; Tierney, 1992). This is also evident in the number of students who experience isolation in their programs. Universities are finding that students are experiencing isolation, anxiety, and distress at an increased rate (Giovenco et al., 2022). The challenges of transition, finding community, and finding support are especially prevalent among students of color.

Fostering success among racially diverse groups is essential because it will enhance the STEM workforce and contribute to an environment where all workforce members work

effectively with diverse populations (Allen-Ramdial & Campbell, 2014). Museus et al. (2011) addressed the disparities and trends associated with diverse student populations' success in STEM fields. Considering minoritized students leaving STEM fields at high rates, Museus et al. (2011) argued that increasing academic achievement and success for racially diverse students is equally important for financial and social purposes. Further, increasing diversity contributes to the growth and development of the nation's global marketplace. Finally, Museus et al. (2011) noted how several aspects of K-12 preparedness and success, such as economic influences, MSI, and campus environments, influenced racially minoritized college students' success in STEM fields.

Accordingly, the CECE Model considers institutional agents such as faculty, advisors, and peers and the impact of those connections on racially diverse students. This consideration falls under one of the nine CECE Model indicators, *culturally validating environments* (Museus, Zhang, & Kim, 2016). The monograph also examines the impact of psychological factors such as motivation and self-efficacy, which are critical components in the CECE Model's *influence* construct (Museus et al., 2017). Finally, it also discusses the impact of STEM-specific programs that provide opportunities, not just increase the interest and enrollment of the program, which falls under the CECE Model's *proactive philosophies* indicator. The model proposes that campus environments are directly and indirectly related to students' ability to persist toward academic success.

Museus and Smith (2016) examined diverse groups of students and the impact of overall campus environments that shape students' experience, success, and academic achievement in STEM fields. Prior research revealed factors that contribute to fostering a campus environment of success among racially diverse students in higher education. Those factors include support of

institutional agents, STEM-specific opportunities and programs of support, and students' motivation, interest, and self-efficacy, all of which influence minority STEM students in postsecondary academic achievement. Furthermore, Museus, Zhang, and Kim (2016) restructured prior conceptualizations of cultural relevance and responsiveness in relation to minoritized students' success. Many prior student success models and frameworks were unquantifiable and untestable, making them difficult to apply. Further, these models were built and framed on theories designed to address societal systems many decades ago. Minoritized groups, historically, were excluded from higher education spaces, so many theories related to student success generalized success factors for all students (Patton et al., 2015). These generalizations are inaccurate for all students and contribute to false narratives of what constitutes a positive postsecondary education, specifically for minoritized students (Museus, 2014b).

Museus incorporated the cultural critiques of Tinto's integration theory to develop the CECE Model (Museus, Shiroma, & Dizon, 2016). The difference between the CECE Model and other models is that the CECE Model uses the voices of diverse groups of students and posits hypotheses and tools that can be quantified and tested (Museus, 2014a). In addition, the CECE Model acknowledges external factors such as family, finances, and employment as well as pre-college experiences or inputs such as pre-academic and attitude and value toward academics before entering the academic space (Museus, Zhang, & Kim, 2016). External experiences have a more significant impact on underrepresented and underserved students. For example, studies show that tuition costs and financial barriers relate to student success and attrition for racially diverse student populations (Cook & Swanson, 1978; Gardner & Barnes, 2007; Knight et al., 2018).

Financial aid awards, scholarships, and grants contribute significantly to student success and persistence (Gross et al., 2007; Herzog, 2018; Perna, 1998). Much research addresses these issues among undergraduate students, but the literature often overlooks contributing factors to success for graduate students. For example, the most significant financial aid programs and grants are only available to undergraduate students (National Center for Education Statistics, 2018). Fortunately, the CECE framework examines various college populations, including undergraduate, graduate, White, and BIPOC students (Museus, 2014a).

Students' employment during their studies also impacts their success (Museus, 2014b). For graduate students, in particular, students assigned work through an assistantship are more likely to reach persistence and academic success because of the community and collaboration they build with peers, faculty, and staff (Cook & Swanson, 1978; Doggrell & Schaffer, 2016). Lastly, evidence shows that external support, such as family, is essential in minoritized students' journey toward graduate success (Anderson & Kim, 2006; Barbatis, 2010; Gasman & Conrad, 2013). These components impact and shape a student's college success outcomes (i.e., learning and engagement, persistence, and overall degree completion). Since the inception of this framework, universities have used the model to capture responses from students across campuses to measure their ability to establish more culturally responsive and relevant campus environments (Museus et al., 2017). For example, a study was conducted on the Norman Brown Diversity and Leadership Scholars program at Indiana University-Purdue University Indianapolis, a scholarship program aimed to recruit and retain students of color committed to social justice.

### ***Focal CECE Model Constructs***

Considered a construct within the CECE Model but not a focal construct is the pre-college experience. *Pre-college experiences* acknowledge that the characteristics and experiences that racially diverse students bring to college impact their academic experiences and outcomes (Museus, 2014a). Sense of belonging, academic performance, and values are all influenced by demographic factors (i.e., socioeconomic status, race, gender, age, family school history); these identities and experiences affect how racially diverse students show up in academic environments (Museus, Zhang, & Kim, 2016). Likewise, students' academic outcomes influence these factors (Museus, Zhang, & Kim, 2016). The CECE Model proposes various constructs, *external influences*, and *pre-college inputs* (Museus & Smith, 2016). The last focal construct of this model is *individual experiences*. These components include the internal factors that directly or indirectly affect minority students' ability to reach academic success (i.e., sense of belonging, self-efficacy, and academic disposition).

### ***CECE Model Construct Indicators***

Along with the environmental factors, the model emphasizes access to culturally engaging campuses that positively align with each student's influences, such as personal motivation, attitude toward academics, and degree attainment (Museus et al., 2017). In examining students' collegiate experiences, the framework identifies two categories: cultural *relevance*, which refers to how campus environments foster a culture that welcomes various cultures and backgrounds, and cultural *responsiveness*, which refers to how campuses provide programming and practices that meet the needs of diverse student populations. Cultural relevance focuses on five indicators: cultural familiarity, culturally relevant knowledge, cultural community service, meaningful cross-cultural engagement, and culturally validating

environments (Museus et al., 2017). Cultural responsiveness focuses on the last four CECE indicators: collectivist cultural orientations, humanized educational environments, proactive philosophies, and holistic support (Museus, 2014b).

### **Cultural Relevant Indicators**

The first indicator under cultural relevance is *cultural familiarity*, which indicates that college students can foster relationships with faculty, staff, and peers who share similar backgrounds and are more likely to experience academic success (Museus et al., 2017). Students with academic support are more likely to experience academic success (Carpenter et al., 2015; Habley et al., 2012; Irlbeck et al., 2014). Examples include qualitative inquiries that found that minority students benefit tremendously from building relationships and connections with university personnel with similar or different racial backgrounds or life experiences (Guiffrida, 2005; Harper & Quaye, 2007; Museus, 2014a).

The second indicator is *culturally relevant knowledge*, which refers to the various opportunities for students to exchange knowledge about their cultural communities (Museus et al., 2017). The relationships built between students through connections in their home communities and experiences correlate with students' ability to achieve success (Museus et al., 2016). For example, White students from underserved communities might sign up for a course on oppressive systems and DEI, creating opportunities for students to develop cross-cultural relationships and connections. This idea is also relevant for students of color; academic and social programs and organizations are valuable in developing cultural connections. Studies suggest that students can develop connections when they learn and exchange knowledge about their communities' characteristics (Mills, 2011). Through connection, students can experience increased motivation, persistence, and success (Kuh et al., 2006; Museus, 2012; Wallace, 2003).

The third indicator is *cultural community service*, which proposes that when students can get involved in the community and create change, those experiences impact their academic success (Museus et al., 2017). The cultural community service framework occurs when universities provide students with the necessary tools to foster change and transform their communities through campus activities, community activism, service-learning activities, and projects that solve problems (Museus, Zhang, & Kim, 2016). An example of transformational cultural connections is from a study where students from a non-ethnic studies course worked together to discuss topics around social issues and work together to develop service-learning projects (Museus, 2014b; Museus, Zhang, & Kim, 2016).

The fourth indicator under cultural relevance is opportunities for *meaningful cross-cultural engagement*. This framework indicates that students access meaningful relationships through cross-cultural connection and engagement (Museus, 2012). It also acknowledges that purposeful and positive peer interactions merit positive college experiences and student success (Museus, Shiroma, & Dizon, 2016). Campuses show that campuses cultivating meaningful cross-cultural environments create positive outcomes for college success. Cross-cultural engagement also increases students' development of cultural awareness (Kuh et al., 2006). Cultivating meaningful cross-cultural relationships across campus is also directly associated with increased self-confidence and a sense of belonging for all students (Museus, Zhang, & Kim, 2016). Finally, the last indicator under cultural relevance is *cultural validation*. This indicator refers to how universities value students' backgrounds, knowledge, and identities (Museus et al., 2017).

### **Culturally Responsive Indicators**

The remaining four indicators fall under *cultural responsiveness*, which focuses on how campus programs, practices, and systems of support work to respond to the needs of culturally

and racially/ethnically diverse student populations (Museus, Zhang, & Kim, 2016). The first indicator is *collectivist cultural orientation*. Institutions can apply this indicator to develop a culture of community and collective student efforts, engagement, and interactions rather than individualistic orientations (Muñoz & Espino, 2017). This indicator also suggests that campuses with collectivist orientations are more motivated to meet the needs of students (Dennis et al., 2005). Through developing a collectivist cultural orientation, students' perceptions of their campus environments are grounded in teamwork and joint success (Museus et al., 2017).

The second indicator is *humanized education environments*, which refer to environments where students can build meaningful relationships with faculty and staff who genuinely want to guide and support them through their academic journeys (Museus, 2012). The ideology around humanized educational environments is related to both qualitative and quantitative research evidence that these environments increase minority students' likelihood of reaching success (Museus, 2014b). For example, Museus used qualitative and quantitative methods to examine three college campuses to analyze how campuses enhance or promote success among Latino and Latina college students (Kiyama et al., 2015). Research suggests that PWIs can foster a campus culture that includes Latino/a students and other minority groups (Kiyama et al., 2015, as cited in Museus, 2011) for those students to advance and succeed in their academic journey.

The third indicator is *proactive philosophies*. These philosophies guide faculty to offer important information, opportunities, support, and resources without asking the student. It is an act of university personnel being proactive instead of reactive to the needs of the students. (Museus et al., 2017). The last indicator under cultural responsiveness is *holistic support*. Holistic support refers to whether students have access to one or more faculty or staff with whom they have built trust and rapport and who can offer connections, information, and resources

(Museus, Shiroma, & Dizon, 2016). Whether it is a personal or professional issue, students have access to someone who can meet those support needs (Kiyama et al., 2015).

### **Individual Influences**

The final construct discussed in the CECE Model is individual influences. Individual influences directly correlate with students' sense of belonging, academic persistence, motivation, performance, and values, significantly impacting persistence and degree attainment (Museus et al., 2017). For example, research shows that a *sense of belonging* impacts student achievement for diverse student populations on college campuses (Museus, Zhang, & Kim, 2016; Tinto, 2017b). In some cases, literature states that it is not definite that a *sense of belonging* has a direct relationship or impact on student achievement. However, studies have found that a sense of belonging is valid among minority students and, even further, a significant component of academic achievement (Hausmann et al., 2007; Hoffman et al., 2002; Lee & Davis, 2000; Locks et al., 2008; Museus & Maramba, 2011; Strayhorn 2012, as cited in Museus, Zhang, & Kim, 2016). For example, a study examined the connection between first-generation and underrepresented students, a sense of belonging, and stress entering postsecondary school. Students who felt they had a more profound sense of belonging experienced fewer feelings of academic stress and depression, positively impacting their academic performance (Stebbleton et al., 2014).

The second variable under the individual influence construct is *academic disposition*. Academic disposition refers to the value students have in themselves and self-confidence in their ability to achieve academic success (Museus, 2014a). Academic disposition and self-efficacy correlate to student academic performance and success (Museus, Shiroma, & Dizon, 2016). Studies reported that self-efficacy positively impacts student engagement, goal achievement, task

choice and completion, persistence, motivation, and performance (Bong & Skaalvik, 2003). For instance, Yusuf (2011) examined the impact of self-efficacy, learning strategies, and motivation on student's academic performance and achievement. Self-efficacy significantly impacts student's learning attainment (Yusuf, 2011). The final variable under the individual influence construct is *academic performance*. Museus, Shiroma, and Dizon (2016) noted that academic performance is one of the leading predictors of student persistence and degree attainment.

Fostering academic success and achievement among minority students in the STEM fields is more important than ever to today's workforce and economic development. For institutions to address this need, interventions must be put in place to ensure that the recruitment and retention of these students increase student success and degree attainment. The CECE Model is used as a theoretical framework to examine the experiences and outcomes of diverse college students (Museus & Smith, 2016). As it relates to this study, the diverse populations include underrepresented and underserved students.

The CECE Model (Museus, 2014a) is an appropriate theoretical framework for this study. Consider the culture of the agriculture and STEM fields historically and today. These specific focus areas are traditionally White male-dominated, which presents barriers to entry for underserved students looking to enter that workforce. With the intent of the Carver Program to develop agricultural and STEM leaders for the future, it is evident that there is a lack of cultural responsiveness and relevance across academic colleges, and programs could be improved. The CECE Model framework provides this study with measurable constructs to best examine the impact and, most importantly, discover how agricultural and STEM areas of study across land grant institutions can work to be more culturally responsive and relevant across university campuses and within specific academic programs. Much like student success, as discussed

earlier, programmatic impact should not only be viewed from a quantitative, university-defined lens. There is value in capturing qualitative real-world experiences when examining student success. The same applies in examining the lengths to which institutions actively work toward becoming more culturally engaging at various levels of the university system, such as colleges, departments, and programs.

During the deductive coding process (the second round of coding), the nine indicators of the CECE Model (Museus, 2014a) were used to measure the perceptions and engagement of current students, past scholars, and faculty with the GWC Assistantship program and the impact on student program matriculation. The nine indicators, also considered the model's focal constructs, were used to develop interview questions for past scholars, current Carver scholars, and faculty. The indicators also measured how students perceived the Carver Program environment. Utilizing this model assisted in identifying possible strategies that could enhance the graduate experience and success of underrepresented and underserved graduate scholars in the Carver Program.

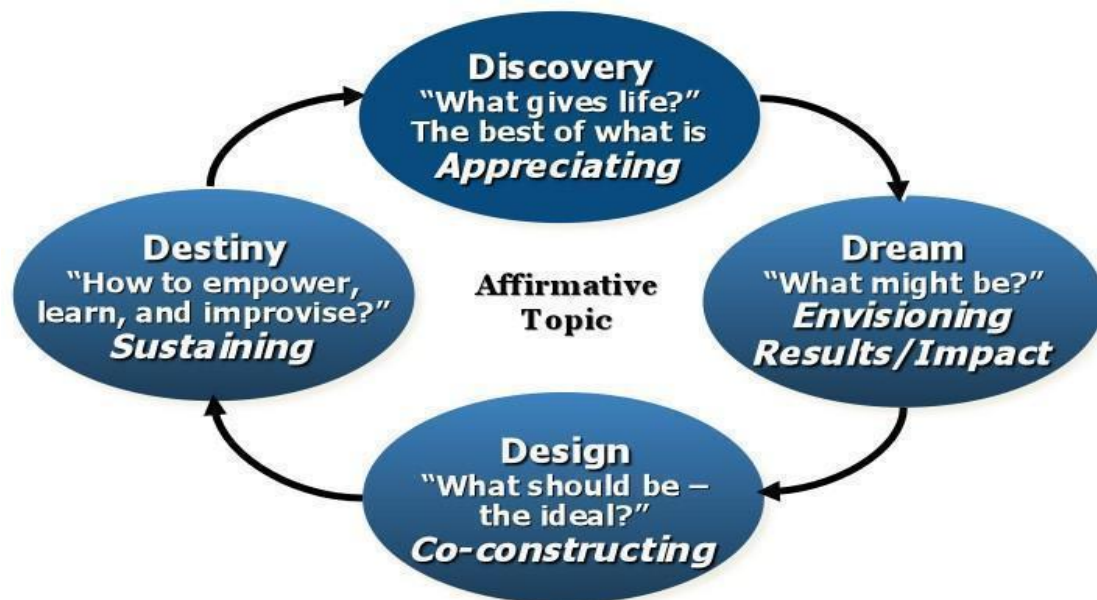
The CECE Model was also appropriate because of the qualitative approach that guided this study. CECE is relatively new and has been most frequently used in quantitative studies. However, it has also been used qualitatively to explore the culture of students' experiences (Garcia, 2016, as cited in Gonzalez et al., 2020). For example, a study was conducted on the Norman Brown Diversity and Leadership Scholars program at Indiana University-Purdue University Indianapolis, a scholarship program aimed to recruit and retain students of color committed to social justice. The study measured the programs influencing student's sense of belonging (Azevedo et al., 2017). They analyzed their data based on the framework's nine indicators.

Further, the CECE Model is appropriate for this study because it acknowledges students and their experiences and considers the faculty, staff, and administration (Museus, 2014a; Museus & Smith, 2016). Faculty and staff are instrumental in recruiting and retaining students in the Carver Program. In addition, Carver fellows often receive their assistantship tasks and assignments directly from their respective advisors. By being structured in this manner, Carver allows faculty and staff to collaborate and strive to provide students with a well-rounded experience to reach academic success and degree completion. CECE's nine indicators all consider how universities engage and respond to student's needs. Therefore, this study utilized the model to explore faculty members' attitudes toward Carver's approach to fostering culturally relevant and responsive environments for students of various ethnicities and backgrounds.

As a theoretical framework, CECE (Museus, 2014a) aligned with this study because it included diverse racial and ethnic populations and identity-based factors that could impact student success. In addition to the various identities students hold, CECE also facilitated an examination of how culturally engaging campus environments influence students' success.

**Figure 1.**

**Appreciative Inquiry 4-D Model (Cooperrider & Godwin, 2011).**



The appreciative inquiry (AI) model is a model that examines organizational issues, challenges, and concerns from a positive lens. AI is a strength-based organizational approach to organizational change and leadership development. Instead of focusing on a program's problems or negative aspects, it allows organizational participants or members to reflect on all aspects of the organization (Coghlan et al., 2003). Instead of focusing on the problems and solutions of the program, evaluators aim for participants to think "best of what already exists." Researchers look for participants to identify if they could change the program and what that looks like for the desired future of the program or organization (MacCoy, 2014).

The AI model reveals a systemic discovery of the things that contribute to the success of an organization and or community when it is most efficient and effective (see Figure 1). AI also provides inquiry, imagination, and innovation, avoiding criticism and negotiation. As a result, the AI model most effectively provides discoveries and designs to programs and organizations.

Although the model does not mitigate receiving challenging or negative feedback on the program's performance, it presents positive questions that reveal growth and potential.

The AI model was developed around the work of scholar David Cooperrider. In 1980, as a Ph.D. student, Cooperrider sought to study physicians in leadership positions in the most prominent medical facilities in the United States. His work allowed him to capture the stories of the successes and failures of physician leaders. Taken aback by these professionals' positive response and cooperation, Cooperrider found that examining the leadership and the organization was most valuable when it was at its best and most effective. The AI model has evolved from an academic theoretical model to a valuable organizational practice model that assists organizations and programs in changing or enhancing their organizational practices, processes, and systems (Bushe, 2012).

AI is impactful in its ability to engage and inspire participants by focusing on their individual positive experiences of the program or organization (Coghlan et al., 2003). For example, suppose a program offers workshops or other engaging activities; participants walk away with an experience they can relate to their own experiences and reach success and achievement. Based on those experiences, participants can identify themes from their experiences and can form an analysis of how the program could continue utilizing those practices or how they can improve. Participants better understand what impacts their success because the responses are grounded in the participant's lived experiences (Cockell et al., 2020). This type of feedback leads the program to repeat those same impactful program aspects reported by the participants to enhance the overall program.

The AI model is an asset-based approach to engagement through an organizational and social context (Organizing Engagement, 2023). The 4-D cycle encompasses four distinct stages,

which allow the organization to identify the positive aspects and strengths and elicit concrete operational steps to achieve program goals. The model does not negate the adverse experiences but instead uses the dialogue to handle challenges differently. Instead of asking what is wrong with the program, it allows dialogue about what could be the causes of adverse experiences to work toward developing the various possibilities to create change within an organization. The first stage in the AI 4-D model is *Discovery*. During the Discovery phase, program participants explore what is best. In this study, Carver Program participants identify the strengths, success, best practices and processes, and areas of peak performance and excellence. This process will aid in developing an in-depth analysis of the program. Allowing the conversation to lead to the positive aspects of the program sets the tone and foundation to allow individuals to share life-going factors. The appreciation for the organization and what they received from participating is alive and enriched through their ability to commune and connect through dialogue.

The Discovery stage is vital for setting the tone for extracting the positive core of the program. Discovery starts the journey to what could come from what has already been established and implemented. The second stage of the 4-D model is a *dream*. Dream refers to the imagination and envisioning the future. The Discovery is vital in the dream process, offering students the opportunity to be ambitious in their thinking of what they desire as the perfect program based on the many positive themes that present from their individual experiences. Students are part of the planning and brainstorming process for developing ideas of ways to move the Carver Program forward positively.

The AI 4-D model incorporates the participants into the program planning process. Therefore, it benefits the dream process by amplifying the positive core aspects of the program (Mishra & Bhatnagar, 2012). Participants are positively influenced to be more innovative,

creative, energetic, and excited about the program's future (Bushe, 2012). Based on the stories shared among the group participants, as part of the dream stage, the group should work to develop common themes. Everyone contributes a valuable experience by participating in the program, and it is essential for them to observe and receive the various unique stories without the opportunity for judgment and criticism. It is critical to acknowledge that during the 4-D process, there is an emphasis on working as a collective and eliminating any opportunity for judgment and criticism.

The third stage of the AI 4-D model is *design*. The design stage involves focusing on the shared ideas and themes derived from the dream phase of the process (Cram, 2010). Shared goals and aspirations for the overall program are developed collectively and collaboratively. Students' ability to categorize ideas and develop and organize themes around their proposed program changes is a key component in this process. The propositions are clear, concise, and aligned with the program objectives and outcomes.

The fourth stage in the AI 4-D model is *Destiny*. The Destiny stage represents the end and conclusion of the previous stages and program process but also presents the start of a fruitful ongoing process of innovation and creative culture through appreciative learning (Bushe, 2012). The Destiny stage in the AI process leads to the delivery of collective new images of the program's future. All Carver participants discuss how they will contribute to co-creating the future in a realistic, measurable, and sustainable manner. Overall, much like other organizational change models, which generate or provide information that assists in improving programs, these are done by the researchers and evaluators. The AI model is most valuable when used to evaluate the Carver Program because the students actively participate and engage in the process and content building.

The model is called the AI 4-D Cycle Model and encompasses the four steps in the transformational change process. The AI 4-D Cycle Model, illustrated in Figure 2, is designed to engage participants in a narrative-based learning process to create positive organizational change (Gordon, 2008). The conversations can be as prompt and informal as having a conversation with a peer or colleague or as formal as a four-day workshop involving a specific stakeholder group. The four key stages of the AI 4-D Model cycle are *Discovery*, *Dream*, *Design*, and *Destiny*, which are explained in detail following the model (see Figure 2).

This study utilized the AI model throughout the development of each participant group's interview guide. When underrepresented groups are often examined, there is a perception that these populations always face struggles and challenges. The researcher employed the AI model to propose a different approach to guide participants in thinking about their experiences with the program in a positive light. The AI model allowed the challenges to emerge as a catalyst for promoting growth through participants' contributions and recommendations as to what the perfect program would consist of moving forward. Program past program scholars, current students, and faculty contributed value to the existence and continuation of the program. Each offering valuable insight from three different lenses can provide rich and in-depth feedback on enhancing the program. Considering the utilization of the model, the researcher structured the interview questions to address the Discovery and dream stage of the Carver Program. The researcher conducted semi-structured interview questions that allowed participants to explore and discuss their perceptions and experiences in their engagement with the program, as well as attributes and characteristics of the program based on their individual experiences.

**Figure 2.**  
**Conceptual Framework**



**Step 1: Discover**—During stage one, participants discussed what they appreciated about the program through one-on-one semi-structured interviews. The researcher attempted to retrieve participant's perceptions of what was good about participating in the Carver Program.

**Step 2: Dream** – Through semi-structured interviews and questions presented by the researcher, participants identified suggestions and recommendations as to how they see the program being more sustainable and serving students for current and future scholars to come. Participants shared their aspirations for what they would like to see the Carver program achieve in efforts to support students throughout their graduate matriculation as scholars.

**Step 3: Design**—The researcher took the data collected from the discover and dream stages. This process consisted of conducting a thorough analysis of their responses, categorizing them, and making meaning of the data.

**Step 4: Destiny**—The final stage formed the recommendations and conclusions of this study. To formalize understanding of the function of this conceptual framework, the Destiny stage would have included bringing each participant group back together and presenting to them a model or report of their compiled experiences, thoughts, and ideas about their engagement with the Carver program. This step was essential for considering how organizations consider their stakeholders to be part of the innovative and creative thinking process to create sustainability within an organization.

### **Summary**

Extant research elicited significant information about the factors that contribute to the success of graduate students. Studies that examined student success from a university or departmental lens shared common themes; however, these studies did not amplify graduate students' voices. In addition, multiple themes emerged from the literature that significantly impact graduate experiences, retention, the influence of degree completion, and overall student success.

The literature examined exposes a need for future studies to focus on the experiences of underrepresented and underserved students in STEM-related fields (Markle et al., 2022). Institutions utilize funding sources to support participants with funding to mitigate the stressors of financial burdens. However, all factors that impact students' experiences in a graduate program should be considered (Walsh et al., 2021). Since assistantship programs offer other programmatic components and resources for graduate students, there is a need for research on the role of these programs in underserved students in agriculture, life science, and related sciences.

The impact of funding is essential, but the community, socialization, advisor/advisee relationships, professional engagement, and mental health are all critical factors impacting graduate students, attrition, and program success (Rigler et al., 2017). Further research will allow for developing strategies to address the impact and practices of assistantship programs designed to increase the recruitment and retention of underrepresented graduate students. These transformative changes can cultivate improved practices at a university, department, and program level to continue developing underrepresented students through supportive learning environments inside and outside the classroom. Much of what the literature has shown is that institutions are indeed working to develop more supportive and inclusive campus environments for students of all backgrounds and ethnicities. However, there still lies the examination of the challenges and barriers to success faced by underserved graduate students. Furthermore, there is a lack of literature on holistic approaches to examining institutional support programs such as fellowship and assistantship programs to better understand student experiences and program outcomes as a strategy to continue developing DEI-funded initiatives and programs that support graduate education in STEM fields.

## **Chapter 3: METHODOLOGY**

### **Statement of the Problem**

As the landscape of graduate education for underrepresented and underserved students within STEM disciplines persists, there is a need for more adequate and sustainable institutional support programs for those student populations. Despite the efforts of institutions to allocate resources toward increasing support and enrollment of underserved and underrepresented graduate students in STEM disciplines, there remains a concern for declining numbers of students reaching degree attainment and overall student success. Despite the efforts of institutions to increase the number of underserved and underrepresented students in graduate programs, specifically students studying agriculture and STEM, there is a concern about declining numbers in the field. While studies have examined factors that impact the success of underrepresented undergraduate students in STEM disciplines, such as persistence, self-efficacy, and motivation, there remain gaps in addressing how institutional support programs impact the success of underrepresented and underserved graduate students in these specific fields.

Since the program's inception, Carver was never intentionally examined through a formal investigative process for input on its impact, how it evolved, and how its stakeholders benefited from engaging with the program through culturally engaging campus experiences. The storytelling of the individuals who have had to interact and engage in the same environment but hold unique experiences based on their role and needs as stakeholders of the program was most valuable and important to acknowledge how institutional program interventions are designed to support students throughout their graduate career in efforts toward reaching degree completion and overall success. The application of the case study research design, in addition to a constructivist and transformative approach, is discussed throughout this chapter. The research

strategy for this chapter includes introducing the research questions, the methodology, the background of study participants, data collection and procedures that follow, data analysis methods, and research ethics to conclude the most important aspect of this chapter.

### **Research Questions**

- 1) What are the experiences of George Washington Carver Assistantship Program's past graduate scholars as program participants?
- 2) How does the George Washington Carver Assistantship Program impact the success of current scholars?
- 3) What are the experiences of faculty in supporting the George Washington Carver Program scholars?

### **Selected Methodology**

A qualitative research approach is the most appropriate for a study that seeks to explore and better understand how individuals or groups make meaning or perceive experiences in response to the research phenomenon (Creswell & Creswell, 2018). The results paint a holistic picture of the participant's lived experiences (Bailey, 2018). The purpose of this study was to examine the experiences of underrepresented and underserved graduate students in STEM disciplines, and a. A qualitative research approach was most appropriate for the study.

### ***Case Study Methodology***

This study was conducted utilizing the case study methodological approach. A case study method approach presents the opportunity to conduct an in-depth data exploration from various perspectives of the unique and complex experiences of a specific group, project, institution, program, or system from a real life context (Simons, 2009, as cited in Moriarty, 2011). Yin (2009) states that case studies allow in-depth investigations to receive the holistic and authentic

characteristics of events that occur in real life with real people. When case studies are applied to real-world issues, multiple benefits exist over other research design methods (Tetnowski, 2015). This case study investigated the engagement and interactions of students in a particular program, other program participants, and faculty and how the program impacts students' success through scholars' participation in the program from a broad institutional level to a college, department, and program perspective. It was important to emphasize the practice of retaining holistic characteristics of real life events for the sake of understanding the value and unique experience of each student and faculty member participating in this study was most important.

### ***Intrinsic Case Study Model***

The type of case study methodology we sought in this study is an intrinsic case study model. An intrinsic case study is a case related to a specific entity (i.e., a school or program), and the focus of the case study develops a richer understanding of one case (Mertens & Wilson, 2018). It is not ordinarily generalizable in other cases. Case study methodology is known to be the primary strategy for understanding the “how” and “why” questions posed to a specific program (Yin, 2009). This study utilized the Virginia Tech George Washington Carver Assistantship (GWC) program as the case study to evaluate its impact on graduate students in STEM fields through culturally engaging campus experiences. Refer to Table 1 to view the propositions related to the research and evaluative assumptions of the study and the participants used in this case study design. This study collected data through semi-structured qualitative interviews with past program scholars, current students, and faculty.

Interviews are a primary form of qualitative data collection and can take various forms. Interviews provide the researcher with an in-depth knowledge of the participants, lived experiences, world views, and opinions (Patton, 2003). The first step in the data collection

process for this study consisted of semi-structured interviews with the Carver Program past program scholars. The second data collection point was semi-structured interviews with current Carver Program scholars, and the third was one-on-one interviews with faculty. Conducting this study was valuable not only to the students but also to the overall program. It revealed the program's ability to foster student success through intentional, holistic programming and access to support resources. It was also critical to highlight the need to collect data from multiple participant groups to provide more in-depth insight into future programming and decision-making.

Continuing with the research methods for this study, the researcher utilized triangulation of data between Carver's past program scholars, current Carver scholars, and faculty. Using multiple data sources and data collection strategies (i.e., interviews, focus groups, and surveys), formally known as triangulation, assisted the researcher in developing an in-depth and credible analysis of findings (Mertens & Wilson, 2018). It investigates or explores the same phenomenon from various perspectives. Triangulation can include multiple qualitative and quantitative methods or multiple qualitative methods. Analyzing data and establishing themes based on the data sources or perspectives could enhance the study's validity (Creswell & Creswell, 2018).

Furthermore, triangulation is valuable and can assist with attaining data saturation (Denzin, 2009, as cited in Fusch & Ness, 2015). At the point of data saturation, one study or research design may differ from a case study design (Creswell & Creswell, 2018). Data saturation can be obtained in as little as six interviews, considering the available number of participants in the study (Denzin, 2009; Sarfo et al., 2021). As for saturation, specifically in a case study design, researchers do not often focus the study on larger populations (Sarfo et al., 2021). In a case study design, the rich depth of information can be lost if there are too many

cases; therefore, some literature recommends 4 to 15 cases to saturation (Mills et al., 2009). Determining whether a researcher has reached saturation should not be contingent on the number but instead on the robust and rich depth of the data (Fusch & Ness, 2015). As part of triangulation, utilization of the nine CECE indicators was presented in the findings and results for the program's ability to engage scholars through cultural relevance and responsiveness. This study was not intended to meet each of the nine indicators but was instead guided by the constructs to measure better which constructs emerged based on program impact and student success. Later, the data results and findings revealed which constructs were most prevalent.

### **Participants**

For this study, the researcher used three distinct participant groups to triangulate the data (Creswell & Poth, 2018). The three groups consisted of past program scholars of the VT Carver Program, currently enrolled Carver scholars, and faculty who were currently advising scholars or had previously advised Carver scholars. By conducting data triangulation from the chosen three groups who had all been involved with Carver, further evidence was derived that fostered the credibility of the study by employing multiple data sources. In addition, it also bred confidence in the observations, interpretations, and conclusions (Creswell & Creswell, 2018), allowing the researcher to best compile the many pieces of information into a compelling narrative (Bitsch, 2005).

#### ***Past Program Scholar Participants***

Past program scholars offered prior knowledge and experiences to the context in which the researcher was examining the program's impact. Past program scholars also added context to how the program had evolved, which contributed to the impact on experiences for current students. Past program scholars were considered students previously in the program as Masters

or Doctoral students. For this study, past participant scholars were also those who had been accepted into the program, whether they did or did not complete their degree. Past scholars should have also participated in or received program or funding support from Carver during their graduate journey.

Past program scholars were chosen to be part of this study considering their participation in the program or completion of their degree program requirements as past Carver scholars because they offered a perspective from having once been part of the program to reflecting on their experiences outside the program. They also offered insight into where they are now in their career compared to where they were when they entered their respective program and how they would have better defined their needs as graduate students based on the knowledge gained through practice and experience. Carver's past program scholars provided a context and foundation for what the program was prior to its current structure. The data showed drastic program changes in how the program engages past scholars versus its current scholars. Having that foundational background data of past scholar experiences of the program potentially revealed various aspects of the program dynamic and organizational structure with current Carver scholars today. The overall mission of the Carver Program is to increase the number of underrepresented and underserved professionals in the STEM field. Considering those factors, past program scholars offered valuable insight from their experiences, offering perspective on where the program once was and input for future program recommendations.

Historically, Carver had not utilized a structured system to keep past program scholars connected to the program. The Carver Program held a log of past program scholars' contact information. The researcher worked closely with the program director to obtain the list of those scholars who participated in the Carver Program during their time at Virginia Tech. The

researcher also used word-of-mouth and communication, such as email, to contact past scholars. The chosen sample size for this participant group was five past program scholars. To qualify, students had to have been part of the program at some point in their graduate career, whether they completed their studies or not. However, each of the past scholar participants was supported by the program throughout their graduate programs until the completion of their degrees. Students who attend Virginia Tech have access to their emails even after their time with the university concludes. Therefore, the researcher was able to obtain contact records of past scholars.

### ***Current Scholar Participants***

The second data source included one-on-one interviews with current Carver scholars. Current scholars presented a perspective on their experiences with the current program's structure, functionality, and overall impact. Current Carver scholars were either Masters or Doctoral students. Students were at various stages in their graduate studies, but they were all scholars who actively participated in programming.

Current students were recruited to participate in the study through direct access to the program. During the weekly seminars, scholars were required to present one time out of the semester about current or past research. The researcher had the opportunity to present the study to the group as part of the recruitment. In addition, the researcher aimed to recruit 5-10 master and doctoral students, both newly admitted and returning students, to participate in the one-on-one interviews. Based on responses from students, five). Five students consented to participate, and saturation was also met based on responses from students. After the researcher conducted three semi-structured interviews, they reached saturation. Carver scholars met weekly as a program requirement. Newly enrolled scholars were more present than veteran scholars for

various reasons; therefore, other recruitment strategies were utilized outside of utilized besides informing scholars of the study during weekly seminar meetings, such as emailing students directly and direct phone calls. For the researcher, there was direct access to meet with students directly, share the aim of the study, and ask for participation during the weekly meetings. The opportunity to recruit students to be part of the study during the weekly meetings also offered an opportunity to discuss the importance of the study because of the positive impact that the study could have on future Carver scholars and the overall program.

### ***Faculty Participants***

The third participant group included faculty who advised past Carver scholars of current students and faculty who held administrative roles. As program support personnel, they offered a different perspective of the program based on their experiences working with Carver graduate scholars and details on how faculty and departments engaged with the program to support scholars.

The faculty played a vital role in this study since management and advising of Carver scholars is left to the departments. Each discussed how their department engaged with the program, specifically for their role in being supportive of connecting students with the Carver Program or being of support through capacities that students need outside of their participation in the Carver Program. Some departments coordinate student funding through the department heads, and some allow each faculty member to coordinate directly with the Carver program to allocate funding to their students (C. Thorpe, personal communication, August 2023). Sometimes, department or program staff coordinate directly with Carver Program administrators. Each faculty member's experiences added a more in-depth understanding of the logistics of the Carver program, which is different from the programmatic aspects of the program. The CECE

Model (Museus, 2014a) was not used to measure the faculty's perspective on how culturally responsive and engaging the program was for students because of their limited engagement and participation with the program. Faculty were not engaged at a programmatic level to answer relevant questions on program initiatives because of their position and relationship with the program.

Carver Program administrators had access to each faculty member's contact information. In addition, program scholars had access to their advisors and departments. The researcher's predominant form of communication for sending out invitations for participation was through email. The researcher invited 5-10 faculty members and supervisors to participate in a one-on-one interview. Five faculty participated in this study, and saturation was met. The researcher recruited faculty from different departments in the CALS. It is essential to recognize that Carver scholars could have an advisor who acts as their advisor and supervisor or have both an advisor and a supervisor. The roles could have been separate depending on how and where their assistantship was structured. Instead of utilizing the Carver Program directors for access to faculty through word-of-mouth with past and current scholars, the researcher was able to obtain the names of different faculty members by speaking with students. Although the researcher obtained some names of faculty directly from students, each of the faculty who participated was not necessarily an advisor or supervisor to the students who participated in the study.

The Carver Program kept a log of each department and program with Carver scholars. In addition to connecting with Carver scholars through established networks and initial conversations, through conversations with current scholars, the researcher gained access to those individuals through email and in-person meetings. It was also important to note that faculty who may have advised students who graduated in the past were valuable to the study. Their

experience of the program when their students were enrolled added value to how the program had evolved and allowed them to provide insight into what faculty found most valuable in guiding students toward degree completion, their perspectives on how they defined student success, and how they sought increased value for future programming.

Each participant group was chosen based on the purpose and priority of the program. The Carver Program functions because of its mission to support underserved and underrepresented graduate students studying agriculture and STEM. Without the students, the program would not exist. Without the support of faculty, the program would not have been able to build partnerships with departments within the college to support graduate students in those capacities. A program serving this student population is critical for supporting program matriculation and graduate student success. As participants of this study, the graduate students of the Carver Program offered valuable insight into how the program had directly or indirectly impacted them while also offering input into what aspects had been successful as it related to their graduate matriculation, where there may have been challenges, and areas in which the program could grow.

### **Data Collection**

For this work, the researcher utilized three distinct groups of participants to triangulate the data. The three groups were past program scholars of the VT Carver Program within the last ten years, currently enrolled Carver students, and faculty who have currently or have engaged in the program in the past. By incorporating triangulation from the chosen three groups who have all been involved with Carver, further evidence is derived that fosters the credibility of the study. In addition, it also breeds confidence in the observations, interpretations, and conclusions (Creswell & Creswell, 2018), allowing the researchers to best compile the many pieces of

information into a compelling narrative (Bitsch, 2005). This study utilized a semi-structured interview guide, which can be found in Appendix A-C. The semi-structured interview questions and the interviewer were the instrumentation used throughout this study.

In the initial questioning, faculty were asked general demographic questions to share the number of years and number of students they had advised in the Carver Program. For both student participant groups and faculty, the more intense questions of experiences and program impact questions were asked following the initial questions to provide more in-depth context from where the students came from to where they were in navigating the institution as Carver scholars. Considering the program functions because of its ability to support graduate students, interviews with past and current scholars concluded with more open-ended questions that would provide more in-depth context toward their experiences as graduate scholars in STEM disciplines and reflect on defining what student success means to them based on their current knowledge and experiences.

### **Instrument Development**

In conducting qualitative research, this study examined the impact of institutional support programs such as the Carver Program on graduate students in agriculture and STEM disciplines. It explored the experiences on a programmatic level as well as institutional experiences as a Carver scholar and what impact these experiences through their participation have on their overall student success. The process used for developing the interview guides for each participant group was very intentional to ensure that the questions were tailored to provide rich and in-depth sets of data. In addition, the instrument development section outlines the systematic approach that was taken to develop and formulate the interview questions used in this study.

The process of developing questions for the interview guides used in this study began with an investigation of the literature on experiences of graduate student success in agriculture and STEM disciplines, community-building, and other factors that impact the journey toward degree attainment. Literature has shown that factors that impact graduate student success are heavily focused on other disciplines in the health professions, specifically, the experiences of women experiencing graduate processes within different disciplines. The literature offered valuable themes to better understand how students' unique experiences navigating their graduate programs impacted graduate student success.

#### ***Appreciative Inquiry 4-D Model Utilization***

A critical component of developing the interview guides for this study was utilizing the AI model. Oftentimes, when there is a focus on marginalized, underrepresented, or underserved populations, there is the perception that with those identities, there comes struggle or negative experiences, which can also be identified as unconscious bias (Saul, 2013). Suveren (2022) identified unconscious bias as the unconscious attitudes, perceptions, and stereotypes that directly impact one's decisions, understanding, and actions toward a particular social group. There is an assumption that because of the position they hold in society or the stigmas that come with holding this identity, it is assumed that they are experiencing challenges and are potentially in need of advocacy and saving. Incorporating the AI model in the development of the interview guide was critical and intentionally done to allow the participants to reflect on their experiences with the program from a positive lens (Kung et al., 2013). The model consists of four steps used in the process of creating positive change. The steps were not used in this process. Instead, the model was used as a guide through its four-step process to assist with the approach to how the questions were formulated.

There was intentionality in developing questions that did not solely focus on the program's problems or negative experiences but instead allowed each of the participant groups to be reflective to think the best of what already exists (Coghlan et al., 2003). This does not negate the aspects of the program or experiences that were not as positive. Through the formatting of the questions, inquiries on solutions to those problems and various challenges faced are addressed by allowing the participants to think about best practices or strategies for moving forward with improvements. Just as the questions were developed in utilizing the model, participants were also asked questions that engaged them as stakeholders to reflectively curate suggestions about organizational vision that could contribute to the overall success and improvement of the overall program (Cummings & Worley, 2015).

### ***CECE Framework Utilization***

This study drew from various insights of literature to examine how institutions, departments, and programs create culturally engaging campus environments. The CECE framework was utilized to guide the interview questions and capture the experiences of each of the participant groups. The CECE framework encompasses multiple dimensions, such as external and pre-college experiences. The framework and existing literature guided the initial open-ended questions at the beginning of the student interview guides. For faculty, the framework was not utilized to develop the initial questions used in the interview guide.

Conducting semi-structured interviews with past program scholars allowed them to reflect on their experiences of receiving support from the Carver Program. Past program scholars were the first group of participants for the study, so we conducted one-on-one interviews (e.g., see "Appendix A"). Each alum was contacted by email or phone to discuss the study's intention and contract if they consented to participate. Conducting semi-structured interviews with past

program scholars added value to the feedback of the program for how the program could have looked different or supported them in other aspects that could have contributed to their overall success, whether they completed their graduate studies or did not complete their studies, but still participated as a scholar in some capacity. We simultaneously conducted one-on-one interviews with past program scholars along with the current Carver scholars.

This study utilized semi-structured individual interviews with the current Carver Program scholars. The interviews will utilize an interview guide designed by the researcher (e.g., see “Appendix B”). Conducting semi-structured interviews with current scholars assisted with developing a more in-depth meaning and understanding of each student’s experiences as a graduate student as a Carver scholar, the culture and climate of the Carver Program, and the program’s impact on the individual student’s academic success. Conducting one-on-one interviews was helpful for students to explore their experiences of their graduate journeys. Questions used in the interview (see Appendix B) guided by the CECE Model assisted with that. Utilizing an ethnographic approach to the interview questioning, the evaluator can gain better insight into the organizational culture through the lens of each participant (Qu & Dumay, 2011). Conducting semi-structured interviews with the interviewees allowed for follow-up questions for clarity and an opportunity for interviewees to expound on their responses (Privitera & Ahlgrim-Delzell, 2018). As a result, the themes around scholars’ influences on their experiences or Carver programmatic topics emerged.

Finally, for this study, we conducted one-on-one interviews with faculty. The interviews for this group of participants happened after the student interviews were completed. The faculty offers a different lens than the alumnus and current students. As participants who have engaged with the program in support, data provided insight and perspective into the relationships and

engagement between faculty, Carver scholars, the Carver Program, and departments. Conducting their interviews in the final stages of the study triangulated the data collection, offering perspective on the program from multiple viewpoints.

### **Research Procedures**

Before conducting the research, the study received approval from Virginia Tech's Institutional Review Board (IRB). Once the study received approval to move forward with data collection, a participant invitation letter was sent to each participant via email (see Appendix E). If the participant agreed to participate in the study, they completed a private When2meet and Calendly link to schedule their interviews.

Each interview was conducted and recorded electronically through Zoom. In addition, interviews were recorded through Otter.ai, an AI meeting note-taker and real-time AI transcription service. Of each interview conducted with each participant group, no participant was invited to participate in the study without verbal or written communication informing the researcher of their consent for participation. Each interview was conducted one-on-one and averaged 30-45 minutes per interview. Throughout the data collection process, as interviews concluded, they were each sent to be transcribed by the professional transcribing services offered through the Virginia Tech Accessible Technologies Group. The communication to submit the Zoom videos for transcription was done through email and the Virginia Tech 4Help Service Portal.

Interviews are essential instruments in qualitative research practices that allow for a more in-depth response to how individuals interpret, make meaning, and define their experiences. Privitera and Ahlgrim-Delzell (2018) define interviews as a series of questions presented to a participant, and responses to the interview questions are verbal. Interviews require the researcher

or evaluator to establish a rapport with the individual so that they feel comfortable and motivated and respond honestly to the questions (Creswell & Creswell, 2018). In utilizing the case study design, Yin (2009) identified six different sources for obtaining methodological evidence: documents, participant observations, direct observations, interviews, and physical artifacts. However, the most used sources of evidence are documents, observations, and interviews (Campbell, 2015). This study took from the case study design to employ semi-structured interview protocols with critical topics and follow-up questions.

An important aspect of this study to consider is acknowledging when the study met saturation. The idea of saturation was adopted from the work of Glaser and Strauss (Mtisis, 2022), which was used from a grounded theory perspective: saturation occurs at the point in which no new codes lead to new and discovered themes. To meet saturation, the study utilized purposive sampling, more specifically criterion sampling, which is when the researcher intentionally selects the participants based on a particular set of criteria and characteristics (Creswell, 2007). Considering this project utilized three different participant groups, saturation was reached at five per participant group. To ensure ethical research practices, pseudonyms were used to protect and maintain the participant's privacy throughout the study (Brear, 2018).

In addition to data collection through semi-structured interviews, memo writing also occurred alongside the interview process. Creswell and Poth (2018) discuss memo writing as part of the theory development process as the researcher captures ideas as data is collected and later analyzed. During the interviews, the researcher utilized memos as an internal check for themselves. The memos served as an independent file from the data analysis documents used to disseminate the data (Bailey, 2018). Both past scholars and current scholar interviews began with demographic questions about the department in which they studied and what years they

participated in the Carver Program. Also, as part of the initial questioning, scholars were asked an open-ended question about their interest in the agriculture and STEM fields.

Although the researcher conducted memo writing throughout the data collection process, the memos and data collected from the memos were not used or presented as additional findings. It was essential to create continuity throughout data collection; therefore, the researcher employed memo writing. Memo writing was also helpful in managing one's biases and reactions, capturing thoughts, developing connections, making comparisons, and asking questions to assist in formulating the research process seen by the researcher (Charmaz, 2014). Memos from this study included thoughts, observations of participants, reflections from some of the responses to questions, emerging thoughts, and ideas around codes, subcodes, and themes as they relate to the theory and phenomenon.

### **Data Analysis**

This study was grounded in understanding how institutional support programs impact graduate student success. Broadly speaking, it was important throughout the study to ensure that each participant's story was told based on their own unique experience as a Carver scholar. For example, how students defined their experience was crucial in setting the tone throughout the interview to better understand how each participant saw themselves through their engagement and interaction as a program participant.

Transcripts were coded in the order in which the interviews were conducted with each participant group. Each participant group consisted of five transcripts per group. Conducting the data analysis in this way allowed the researcher to focus solely on the responses from that group, be reflective during the analysis to make meaning of the data, reshape the questions being asked where needed, and draw connections from the interview questions and emerging data to the

theoretical framework and overall phenomenon. Codes for this study were created before, throughout, and after the data collection process. The researcher conducted coding manually and through the utilization of Atlas.ti, an AI computer-assisted software that provides qualitative data analysis tools to analyze and organize data (Bower, 2021).

Coding the transcripts was a vital component of the data analysis process. Typically, in case study research, the data analysis consists of a few steps: description, which involves the “who, what, when, where” as it relates to the phenomenon; interpreting data; developing conclusions; and identifying the significance (Schoch, 2020). This process led to extracting parts of the data and breaking them down to manage better and make meaning of the participant experiences. Through interactions with the raw data, drawing up findings through patterns, themes, and categories are critical components of the inductive process in qualitative analysis. The data analysis steps utilized in this study integrated both inductive and deductive coding into the data analysis process. From the inductive and deductive coding process, themes and subthemes are derived. Participants provided in-depth responses on their experiences with the Caver program. The data that is represented in the chapter was chosen through quantification of the quotes that merged most. Based on the data, the final quotes were determined by the number of times the common theme emerged from the data. Quotes were also chosen based on the quote that best represented the overall themes and subthemes.

### ***Inductive Open Coding***

The first round of coding began with open coding, which encompassed the process of acknowledging any emerging patterns based on the raw data (Chandra & Shang, 2019). In using case study methodology to design this study, the codes and patterns that emerge are considered “labels” to recognize the patterns, emerging themes, and categories found throughout the data

(Joffe & Yardley, 2003, p. 63). The open coding process consisted of reading through the transcripts multiple times to then create tentative labels to summarize chunks of data. It was important for the data to speak for itself in telling the stories of the participants; therefore, this first round of coding was not based on existing theory. However, going through the open coding process assisted with the next phase of coding, which was guided by theory. From this coding method, although the codes that emerged were newly developed, in becoming more familiar with each piece of data, the researchers were able to memo for future reference in making connections between predeveloped codes and theory. The labels or codes that emerged were solely based on the meaning of the raw data. Finally, part of the inductive analysis process was *descriptive in vivo* coding to examine and determine the most meaningful patterns that emerge that would make up data sub-categories (Charmaz, 2006). *Descriptive in vivo* coding includes a word or phrase summarizing the topic found in a passage of the data (Mertens & Wilson, 2018). *In vivo* is a form of categorizing qualitative data to analyze or summarize the data (Manning, 2017). *In vivo* defines distinct parts and aspects of the data, and from there, the researcher can analyze the data more closely (Theron, 2015).

### ***Deductive Coding***

The second round of coding consisted of taking a top-down approach from a specific theoretical framework to hypothesize, add knowledge to data, or challenge the theory (Creswell & Plano Clark, 2007, p. 23, as cited in Bingham & Witkowsky, 2021). The researcher utilized Museus et al.'s (2017) CECE Model of nine measurable indicators to conduct deductive coding. The nine indicators assisted in guiding the second data analysis process. They were used to examine how the data aligned with the CECE Model. In addition, based on the CECE Model's constructs, the researcher examined the student relationship between the program and its

engagement and impact on students' graduate experiences through culturally engaging and responsive campus experiences. The researcher intended to develop questions for the interview guide that could respond to each of the nine indicators (e.g., see "Appendix D") for sample questions that align with each of the nine indicators that are also used through the interview guides in Appendix A-C. Although the researcher developed a sample question that could respond to the nine indicators, the final interview guides consisted of questions that could capture a response to answering how the CECE Model indicators emerged throughout the data. This study was not intended to meet each of the nine indicators but instead identify new themes and identify which CECE Model indicators emerge from the data that answer the phenomenon regarding impact and student success within Carver and analyze the data using the CECE nine indicators.

Once the researcher collected, read, and interpreted the data, it created the foundation for forming a meaningful analysis (Bazeley, 2009). The next stage of coding is *axial* coding. Additional technology analysis programs are often used to expedite the analysis process, i.e., labeling interview passages for field notes and comparative analysis, locating commonalities, grouping, and categorical coding, and comparing passages in transcripts across data (Patton, 2003). The final stage was thematic coding analysis, where we identified and evaluated all the created code categories and made meaning of the findings (Castleberry & Nolen, 2018). The focal point of research is not always the data collection but the data analysis, the relationships that derive from the data, and how it is relevant (Rabiee, 2004).

### **Trustworthiness**

Researchers must meet high standards of research excellence. Often, when researchers meet that standard, the work is of high rigor and validity (Creswell & Poth, 2018). Other

researchers focus on the idea of trustworthiness in their work. However, both validity and trustworthiness are directly associated with producing research that is of high quality and rigor. Validity and trustworthiness reflect directly and accurately reflect the experiences of the participants (Bailey, 2018). Along with validity and trustworthiness, there are additional research standards that suit different approaches to qualitative research traditions, including case studies. These standards include credibility, which refers to the believability and authenticity of results; reliability and dependability, which refers to the questions asked in the study resulting in the same or roundabout responses if duplicated; and lastly, transferability, which refers to the applicability of the findings (Creswell & Poth, 2018; Lincoln & Guba, 1985; Toma, 2011).

This study made efforts to ensure that trustworthiness, credibility, validity, and reliability were employed throughout the research process. There are various ways to establish these standards within a study; one way is to ensure there are no existing biases in the researcher. From the perspective of ensuring credibility in this case study, the participants were the focal point of the case. Therefore, credibility was critical for accurately describing the participants (Elo et al., 2014). For any research, the researcher must approach, examine, and interpret the research from an unbiased perspective. To limit the biases of the researcher in this study, adopting the approach to transcribe and code each transcript manually allowed the researcher to be engulfed in the data to gain a more in-depth understanding of the participants and content from the interviews. In addition, it was also critical for the researcher to conduct a comparative analysis to fact-check and ensure credibility in the relationship between what was found in the analysis, results, and connection to the CECE Theoretical Framework.

Establishing the point of saturation was also a key component to ensuring the data included in the study was credible. Saturation is defined as not receiving additional knowledge or

information to answer the phenomenon (Bailey, 2018). When the data concludes with fewer and fewer insights from the participants, the researcher should move to conclude the data collection process. Validity was demonstrated in the study through triangulation, which includes conducting research in multiple ways or utilizing multiple data sources to determine if the data is consistent. Additionally, to also obtain a more rich and comprehensive understanding of the case and its participants (Creswell & Miller, 2000). As for transferability, although the findings and results could be transferred across other Carver-like programs, this study was developed to focus solely on the Virginia Tech Carver Program.

### **Summary**

The purpose of this chapter is to introduce the research methodology processes used to guide this qualitative case study research design for how institutional support programs such as Carver impact the success of graduate students in STEM disciplines through a culturally relevant and responsive lens. The approaches outlined in this chapter were best utilized to gain a deeper understanding of the student's and faculty's individual experiences toward cultivating positive experiences for program scholars. The most critical component discussed in this chapter was outlining, based on the processes taken to undergo this study, the final steps toward developing the overall trustworthiness of this case study, which was most important in justifying what was derived from the research process, which can be found in Chapter 4.

## **Chapter 4: RESULTS AND FINDINGS**

This chapter aims to explain the results and findings of the data collected throughout this study. The case study research design aimed to identify factors that impacted the success of graduate students in the Carver Program. The sections that follow examine in-depth the insights from the three participant groups and how the experiences from each participant group informed the next to better understand program impact through culturally engaging campus experiences.

### **Research Questions**

The data findings from this research were guided by the following research questions:

- 1) What are the experiences of George Washington Carver Assistantship Program's past graduate scholars as program participants?
- 2) How does the George Washington Carver Assistantship Program impact the success of current scholars?
- 3) What are the experiences of faculty in supporting the George Washington Carver Program scholars?

### **Sample**

This study encompassed 15 interviews: five past scholars, five current scholars, and five faculty. Each participant was represented by different agricultural and STEM-focused departments within the Virginia Tech College of Agriculture and Life Sciences (CALS) and the College of Engineering. The years of participation of past Carver scholars who participated in this study were from the Fall semester of 2010 to the Spring semester of 2023. Of past program scholars, only one student was a master's student, and the remaining four past scholars were doctoral students. For current scholars, two participants were master's students, and the remaining three participants were doctoral students. Years of participation for current scholars

ranged from the Fall semester of 2021 to the Spring semester of 2024. The faculty averaged to have advised four Carver scholars. The range for when faculty advised students was from the Fall semester of 2010 to the Spring semester of 2024. Considering that this case study focused on a particular program, the confidentiality of the participants was the most important thing. Therefore, the social identities of the participants are shared very broadly, yet they captured data that was useful in understanding the evolution of the program. In addition, it was essential to present the academic demographics of the participants to illustrate the engagement among participants in the program. Table 2 illustrates the academic demographics and pseudonyms for each participant group. To have been able to participate in this study, participants had to meet the requirements. To be eligible, study participants were:

#### ***Past Program Participants***

- The criteria for past program scholars to participate in the study was that they were no longer in the program but had participated in the program for at least a semester. They could not complete their studies during their time of enrollment or graduated out of their program as scholars.

#### ***Current Scholar Participants***

- The criteria for current scholars to participate in this study is for master's and doctoral students to have currently been enrolled in the program. They could be at any stage of their program but had to have been enrolled in the program while conducting the study.

#### ***Faculty Participants***

- The criteria for faculty to participate in this study is that they were faculty or administrators of program scholars. Faculty who participated in this study were either

direct advisors to program scholars or administrators of programs that had students who were Carver scholars.

**Table 1.**

*Expressed Identity of Participants*

<b>Pseudonym</b>	<b>College</b>	<b>Years In Carver</b>	<b>Degree</b>	<b>Participant Group</b>
Marcus	College of Agriculture & Life Sciences (CAL S)	Fall 2010-Spring 2012	Master	Past Scholar
Charmaine	CALS	Fall 2015-Spring 2018	PhD	Past Scholar
Sherry	CALS	Fall 2015-Spring 2018	PhD	Past Scholar
Cameron	CALS	Fall 2016-Spring 2021	PhD	Past Scholar
Chad	College of Engineering (CE/CALS)	Fall 2020-Spring 2023	Master	Past Scholar
Nia	CALS	Fall 2021-Present	PhD	Current Scholar
Jayla	CALS	Fall 2021-Present	Master	Current Scholar
Daniel	CALS	Fall 2022-Present	Master	Current Scholar
Michael	CALS	Fall 2023-Present	PhD	Current Scholar
Donya	CALS	Fall 2023-Present	PhD	Current Scholar
<b>Pseudonym</b>	<b>College</b>	<b>Years Advising Scholars</b>	<b># of Scholars Advised</b>	<b>Participant Group</b>
Dr. Denson	CALS	Fall 2010-Present	6	Faculty

Dr. Cluster	CALS	Fall 2013- Present	3	Faculty
Dr. Baxter	CALS	Fall 2013- Present	6	Faculty
Dr. Sanders	CE	Fall 2015- Present	3	Faculty
Dr. Rendón	CALS	Fall 2021- Present	2	Faculty

## Findings

### *Research Question One: Experiences of George Washington Carver Assistantship Program's Past Graduate Scholars as Program Participants*

*What are the experiences of George Washington Carver Assistantship Program's past graduate scholars as program participants?*

Research question one sought to explore the impact of the Carver Program on past program participants. The overarching themes that emerged from this part of the study and the first participant group included *holistic approaches toward student success*, which established the experiences and values that contributed to students embarking on their graduate journeys as Carver scholars. Table 3 also illustrates subthemes, such as valued experience, community, empowerment, access to resources, and career impact, which are highlighted as directly reflecting the holistic approaches that impacted past scholars' individual experiences. The researcher examined the impact of the program on graduate student success and to better examine ways in which the program evolved. Each past participant was asked about their experience of being part of Carver, their interest in the STEM field, how they discovered the program, and their experiences throughout the program. The second overarching theme that emerged included *fostering a sense of belonging through institutional programs*. The CECE

Model was instrumental in identifying the three constructs that were most visible throughout past scholar experiences, which are cultural community service, cultural familiarity, and proactive support, as shown in Table 4.

The CECE Model constructs assisted in highlighting how past program scholars perceived their graduate experiences from their participation in the Carver Program as well as reflected on an institutional level. Past scholars were asked questions on the program’s impact on the utilization of various graduate resources, as well as questions on envisioning the program serving themselves and future scholars. The latter question asks past scholars to share what they would tell themselves or future scholars on navigating the university with the identity of a Carver scholar. This is where the third and final overarching theme emerged: *envisioning increased value for the Carver Program and future scholars*. The subthemes that emerged included increasing faculty engagement, increasing program initiatives, mentorship, and scholars maximizing program values (Table 4). The data shows the participants’ references to their relationship with Dr. Grayson. As referenced earlier, Dr. Grayson is the founder of the program. He was not a participant in the study. Below are the tables that represent the three overarching themes and supporting subthemes to support the research question on past scholars’ experiences during their time as scholars and program impact on their journey toward reaching academic and career success.

**Table 2.**

*Theme 1: A Holistic Approach Toward Student Success (Holistic Pathways)*

<b>Subtheme</b>	<b>Participant Comments</b>
Pre- Grad Degree Experiences	“Growing up on the farm, when I heard agriculture, all I thought was the cows that we had out in the backyard. I didn’t think about all the other stuff. Long story short, I switched over to environmental science. Being in agriculture allowed

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me to marry my love for STEM and experiential learning and apply science and made all of those things that I've been doing real to me. That, I guess, was my official introduction and how I got officially into agriculture and knew that I was into agriculture." – *Charmaine*.

"Growing up, I was told I'm good at science. I wasn't always very good at math until I got to college really, and I wanted to have a viable career. I didn't go into History or English like some people wanted me to. I really wanted to go into music at one point, but that wasn't going to work out. I decided to go into STEM." – *Chad*.

"To be honest with you, my background is agriculture. I grew up on a farm in a tiny rural area. I had no intentions of majoring in ag because of growing up on a farm; I didn't like it, and I didn't want to be a part of it. In one of the conversations I had with a mentor, we spoke about ag is not just what you're used to growing up in. It's not just tobacco or cattle or things that you and your family do. There's a whole new world to what agriculture is, and there's a whole new world of careers that you can tap into. From that conversation with the mentor, that pushed me into majoring in ag, and continuing that interest into my graduate school experience." – *Sherry*.

"I knew a fellow colleague. Her and I, we ran to each, and she had told me about Virginia Tech, she was currently matriculating her degree at Virginia Tech, and had just started, but she went through the George Washington Carver Assistantship. At that time, I had wanted to work on a PhD eventually, so I took advantage of the opportunity, like going to grad school." – *Cameron*.

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Access to Resources and  
Funding

"I told a mentor of mine that I think I'm finally ready to pursue my Ph.D. He said this is an opportunity for you to interact with other scholars who have a similar interest. He said, number 1, it's going to pay for your education, and number 2, it's going to provide you with an assistantship. However, he said, number three, it's going to allow you to have the opportunity to engage and connect with other scholars with like-minded interest." – *Sherry*.

"The program director called and said I'm coming to [institution] to meet with me. I went ahead and applied, and I

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went to the student preview day. I had an excellent experience as a student preview, and then I had a really good experience talking to the program director. I was like, well, I'm going to do it, and then I got accepted to both the program and the Carver program." – *Charmaine*.

"I love that financially, just helping me get a place to breathe when it feels that there's nowhere else I could." – *Chad*.

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#### Community

"Carver gave me the stability to maintain a social life. Honestly, the connections I made there are important to me not giving up earlier." – *Chad*.

"I'm very appreciative of people that I know that came to our defense. That's important because, being somewhere like Virginia Tech, I had to learn how to navigate and find community. They struggled and navigated, but they eventually got to it engaging with other students." – *Cameron*.

"For me, as a Carver scholar, the little wins were the most significant. Being able to have a group of people that looked like me. Academic success from a Carver perspective was having someone to support you along the way, no matter what they had going on, you found family, and you were grounded in that circle." – *Charmaine*.

"The seminars were once a month, where all of the Carver scholars would come together. We would each take a turn presenting or facilitating. We would talk about our research and different things, facilitate that to other Carver scholars, and then, of course, receive feedback. That was something we always looked forward to. In terms of the Carver community, I would say I felt a part of it. Dr. Grayson always did an amazing job of keeping us connected. Whether it was through an email, through our seminars, through just a check-in, he always made us feel that we were connected, and that's something that I appreciate" – *Sherry*.

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#### Empowerment

"I was fortunate at the time to have other graduate students that were African American. Some were in my department; some were in other departments within agriculture that I could learn from because, at the time, they were working on their PhD, and I was working on my master's. Outside of me doing the work, I'm watching my peers and like, hey, they can do this; why can't I do it too? When you talk about success and

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checking off my objectives, I knew that I could go for a PhD.”  
– *Marcus*.

“Understanding that there are going to be those trials and tribulations but ultimately succeeding in ways in which you may have never thought you could succeed. You may have never thought that you would be able to. It really became being able to really articulate yourself, grow, and evolve.” – *Cameron*.

“We talk about wins, we may spotlight a program, we talk about program updates, but one thing that I took from that experience was to allow those folks around you an opportunity to express themselves, an opportunity to share what’s been bottled up.” – *Sherry*.

“I started learning how to network. To be completely honest, I consider myself an introvert. I function well when I’m teaching, but it exhausts me. So, beyond teaching and presentations, I’m not really a sit-and-have-small-talk type of person. But it did push me out of my conference zone in that regard. Getting to know people in other areas of the university, starting to understand how the university functions, and understanding what, I guess, professional relationships look like. The environment at a PWI, of course, is a lot different from that at the HBCU. I will say that being in Carver, I think, helped me learn to navigate that hidden curriculum that people talk about.” – *Charmaine*.

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#### Career Impact

“It’s almost like Carver, the scholar's program, and my mentors and other faculty that I had a chance to work with really shaped me and really helped me develop more of a purpose of why I wanted to do extension. Extension, of course, is one of those careers. You don’t do it for the money; you do it because you have an appreciation of change, how you can change your communities, and working with families and working with other individuals, and you have a passion for outreach and really putting forth initiatives and programs that are going to be very impactful. For, in my case, low-income limited resource communities. Being a part of that Carver Scholar Program, and again, talking to some of my mentors and peers who were part of the program and not, that was just a part of the department, really helped me, like I said, develop more of a focus of why I wanted to do extension work.”- *Sherry*.

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“It taught me how to really think about how programs such as Carver, how imperative it is to have just even on a regular scale, something like a 4-H, FFA, and Jack and Gill, youth programs like that promote student success in high school. How do we continue to push those programs to create change and are sustainable?” – *Cameron*.

“I think it is just a desire to help my community. Carver gave me the resources to do the thing that, career-wise, I had been dreaming about doing anyway. I also say I have connections I never would have. It introduced me to Virginia Tech because I had never thought about Virginia Tech without Carver. I knew it was a school in the mountains, but that was it. I wanted a PhD., but I didn’t know how to go about it. If not for Carver, I wouldn’t have even been introduced to the possibility that I could” – *Charmaine*.

“When we had that workshop on academics and how few people with a PhD get into academia, I realized that I really did not want it that much. That academia was not a life that I was really all that interested in.” – *Chad*.

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**Table 3.**

*Theme 2: CECE Engagement Indicators*

<b>Subtheme</b>	<b>Participant Comments</b>
Cultural Community Service (Cultural Relevance)	<p>“I was a part of a Graduate Student Association at Virginia Tech. When Black History Month came around, we were able to connect with NSBE and some other undergraduate clubs or associations to provide some service within the community.” – <i>Marcus</i>.</p> <p>“I was always interacting with people of different cultural backgrounds. I also worked with faculty members who worked in various capacities at the university. A lot of interaction took place because of that. I also worked with the SOAR team for a little bit with undergraduate students who were non-White. Working with those students to help them learn how to navigate their collegiate experience. I had a lot of diverse interactions during my time there.” – <i>Charmaine</i>.</p> <p>“I signed up for MANRRS and started going. Then, I joined the E-board. I helped make a positive impact on the</p>

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community by starting to bring people into MANRRS. Carver introducing me to MANRRS was a huge help. I wish there was a MANRRS chapter where I'm going next because I really enjoyed it." – *Chad*.

"I needed summer funding, and through my network from participating in Carver, I had the opportunity to work with the Multicultural Academic Opportunities Program (MAOP)." – *Cameron*.

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Cultural Familiarity  
(Cultural Relevance)

"Carver exposed me to network and talk to other ethnicities that I've never had a chance to meet and greet with the support that they have helped me in, whether it's a class-related project, to helping me on data collection and just walking and talking through that and learning more about them. I think that that has positively impacted my experiences in Carver. Because Carver doesn't put you in your zone and element with one race, you're able to meet different ethnicities of students and different racial backgrounds, with different experiences and live experience even including faculty members." – *Marcus*.

"During seminars, We were always encouraged to reach out and talk to other faculty members, especially if there was some research that they were working on and we found interest in that research. We were always encouraged to go and speak to that faculty member. Hey, I would love to be a part of this work. Can we talk a little bit more about that? I feel like, in general, Carver boosted that mobility so that we would have an opportunity to work and do research with other faculty members and other scholars. Because it was always something that was pushed and ingrained that we do" – *Sherry*.

"Especially at an institution where we really are the minority, coming from an HBCU where you are part of the majority, the Black Graduate School Organization (BGSO) was a big plus. Being active in that, and Black Student Association (BSA)" – *Cameron*.

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Proactive Philosophies  
(Cultural Responsiveness)

"One of the things Carver taught us to do outside of making sure you were doing what you needed to do to keep your money, but one thing the Carver Scholar Program really relied heavily on was giving you space to network and providing a space for you to display and facilitate your work." – *Charmaine*.

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“MANRRS really prepared me as well through that network across the board, with industry and government being on the scene to listen and learn from others. It’s crazy because one of my mentors now still works with USDA and remembers me from being a graduate student and having that conversation. I would have to thank the Carver funding for just that exposure.” – *Marcus*.

“I feel like when I got into grad school, there weren’t as many people telling me, hey, you could go here to get help with this, or you go here to get help with that. Carver provided resources between the writing center and the Ombuds persons; they were guiding us in the direction of potential resources coming from all facets of the university, and that’s not something that I was getting anywhere else. It has been useful, especially for an academic career, being able to understand that there are multiple versions of the same resource and the places you need to look for them. Now, going into another grad program, there are already places that I’m looking for: the University Writing Center, but a more specific one like we talked about in Carver”- Chad.

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**Table 4.**

*Theme 3: Envisioning Increased Program Value*

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<b>Subtheme</b>	<b>Participant Comments</b>
<b>Increase Faculty Program Support and Engagement</b>	<p>“I had one advisor during my time in Carver, and they supported me being in Carver, but the program wasn’t formalized enough to say that I’m doing this with Carver. It was just going to a meeting once a month, that was it, and then we had to present. It wasn’t really anything else that they had to have a relationship for. They could have been having meetings that I didn’t know about, but I’m not aware of any.” – <i>Charmaine.</i></p> <p>“I also think there should be a trained-trainer situation where that resource is trained for faculty that are working with Carver students. That way, when you have students with your advisor, they already know about the Carver program. They’re following along with this guide or roadmap with you so that no other student is getting something different, no matter what faculty member they’re working with. That can show a strong success in the completion rate of a Carver student graduating.” – <i>Marcus.</i></p>
Increase Program Initiatives	<p>“We should continue to do seminars and workshops more often. In addition to the seminars and the opportunity to network, a perfect Carver Program would have provided some additional support when it came to things like research methods and things of that nature. I guess a perfect Carver Program, in addition to the seminars and stuff, would include some additional maybe splash labs as it relates to research methods, statistics, and a lot of those basic core courses that you’re going to need for your dissertation research. Dissertation 101, more of those hands-on professional development. More professional development that touches on a lot of those core things that we need as students and that we need to be well versed in to do well as a student, and especially when it comes to putting together our dissertation.” – <i>Sherry</i></p> <p>“We need to increase our engagement with different Minority-Serving Institutions, creating sustainable relationships with these institutions” – <i>Cameron.</i></p>

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“What other resources are there to help students when they come in? Maybe there’s a guidebook that should be created on some of the facets of the historical component of Carver, give some demographic in terms of data on what you’re doing right now that could be flipped into a publication, that could be put into a guide. Then what are the’ resources that could be really helpful given to that student.” – *Marcus*

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## Mentorship

“Having a guide as a mentor or a friend, just somebody that’s a current Carver scholar so that you have somebody that you’re working with. They’re doing the same thing, just maybe different disciplines or expertise. In addition to having somebody outside of a faculty member who has already gone through it and is able to connect them, I think that that’s beneficial to somebody like, for instance, myself in my career.” – *Marcus*.

“An assigned mentor. For instance, if a faculty member accepts a student who’s receiving funds from Carver, they have a checklist of stuff they have to do with a student. They have responsibilities to their Carver scholar that they have to uphold, and vice versa. Carver understands what each student is receiving because, many times, everybody has different mentoring styles, but there are certain standards that a faculty advisor should have connected you to opportunities, helping you to publish at least one or two papers. I think from that aspect, having an assigned mentor to work with you through that, or either having your faculty advisor say that as a faculty advisor of a Carver scholar, I agree to do this with this scholar because we know that we’re coming in on Carver anyway because we’re already underrepresented, students that have different backgrounds and for lack of a better term, lower access to resources or accessibility for programs like this. So to have that standard or guideline, I think, thinking about it from my own experiences, would have been very beneficial to me because I would have, Number 1, as a first-generation college student, knowing what to expect from my faculty advisor or my faculty mentor, and I would have had a checklist of milestones and goals that I needed to complete by the time I get to a certain point.” – *Charmaine*.

“I would say even a mentor. Again, we’re all right there together whenever we have Carver activities, but if there was someone that’s in maybe Year 2 of their Carver

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Scholar Program that could take on and mentor a new student for a year, I think that would be helpful because again, you have people coming into Blacksburg. Some have never been to Blacksburg. Some are from far away, some closer than others. Maybe even some type of mentorship layout where you have seasoned Carver scholars take on the task of mentoring a new student, whether it's for a semester, for the whole first-year, but just really helping them become acclimated to the area and then acclimated to the department. Just more time for students to network and work together through professional development and mentoring.” – *Sherry*

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Scholars Maximize Program Value

“Don't be afraid to communicate with the program director. Understand what level of commitment you think you can handle.” – *Chad*

“Lean into your resources. I could have leveraged a lot more opportunities and connections with Carver, but I didn't know how. Relationship-building is key, and it's not what you know; it's who you know at some point. With Carver, you do have people who are trying to see you win and not necessarily compete with you, but you have to lean into that and be open to that and maximize those relationships in the time while you're there, but you have to make time to nurture those relationships.” – *Charmaine*.

“The butterflies and the fear that you are feeling are more so because you're in a new environment somewhere you've never been before, and you are being forced out of your comfort zone. I would start by saying you're going to be okay; you just have to be comfortable being out of your comfort zone and creating a new experience for yourself. Ask questions for clarity and understanding because that will really begin to help you develop deeper meaning. I would tell myself, and that person, if you're in a classroom space or if you're in a meeting and there's nobody else that looks like you, it's okay. I would tell that person to continue to stand tall, continue to be present, continue to communicate and network in those settings, and never accept second best. Never feel like you're not supposed to be there or you're in the wrong room because you're not, and never be afraid to speak up. What you have to say is relevant, important, and necessary to be heard.” – *Sherry*.

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“Come optimistic, remain optimistic because this is you investing in yourself. This is you taking advantage of an opportunity that your family and friends have never had this opportunity. Well, that’s a master’s or PhD that you’re about to embark on a journey in which you had to really hone into where you can’t quit. Use Carver to your advantage. The social aspect is very much just as important as the educational aspect, or as you’re pursuing or matriculating your degree, the social aspect is very important. Don’t quit, you can’t quit.” – *Cameron*.

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### ***Discussion Research Question One***

In the discussion for Research Question One, the data provided an abundance of perspectives of the past program scholar participants and how those experiences shaped their graduate experience and enhanced their graduate education experience and overall success. Furthermore, and consistent with the CECE Model, past scholars offered insight into the experiences that appeared throughout their graduate matriculation and potential outcomes to envisioning the future of the program (Museus & Smith, 2016). Theme One, the holistic approach toward student success, offered insight into understanding how students holistically defined student success based on their individual experiences.

*“One of the conversations I had with a mentor was about ag, which is not just what you’re used to growing up in. It’s not just tobacco or cattle or things that you and your family do. There’s a whole new world to what agriculture is, and there’s a whole new world of careers that you can tap into. From that conversation with the mentor, that pushed me into majoring in ag, and continuing that interest into my graduate school experience.” – Sherry*

Participants were asked about how they defined success. The participants discussed their journey in the agriculture and STEM fields and the fostered relationships that assisted them in learning about the Carver Program.

*“Carver gave me the stability to maintain a social life. Honestly, the connections I made there are important to me not giving up earlier.” – Chad.*

Past scholar participants defined student success by their past experiences, which established the need for community, access to resources, and empowerment.

*“For me, as a Carver scholar, the little wins were the most significant. Being able to have a group of people that looked like me. Academic success from a Carver perspective was having someone to support you along the way, no matter what they had going on, you found family, and you were grounded in that circle.”- Charmaine.*

The CECE Model has the power to transform students’ experiences through a holistic, transformative approach by considering the whole student, which consists of acknowledging the external influences such as financial factors, family influences, and other relationships that shape their academic experiences and outcomes (Museus et al., 2017). Theme Two, CECE engagement indicators, supported the actual experiences as a Carver scholar from a program level to an institutional level through the utilization of the CECE Model while still acknowledging how these experiences shaped their experiences personally and academically toward reaching success. For example, the researcher asked past scholars about how they were able to connect with students and faculty from various cultural backgrounds. According to Kinzie and Kuh (2017), student success refers to the ways in which students reap the benefits of their educational

experiences. Students discussed the experiences of that success through culturally engaging interactions and experiences with peers, as defined in the nine indicators of the CECE Model.

*“Carver exposed me to network and talk to other ethnicities that I’ve never had a chance to meet and greet with the support that they have helped me in, whether it’s a class-related project, to helping me on data collection and just walking and talking through that and learning more about them. I think that that has positively impacted my experiences in Carver. Because Carver doesn’t put you in your zone and element with one race, you’re able to meet different ethnicities of students and different racial backgrounds, with different experiences and live experience even including faculty members.” – Marcus.*

Participants were also asked about their experience in making cultural community impact. Participants expressed that because of their need for funding, through their network from participation in Carver, they had the opportunity to work with other institutional support programs that serve underrepresented undergraduate students.

*“I was a part of a Graduate Student Association at Virginia Tech. When Black History Month came around, we were able to connect with NSBE and some other undergraduate clubs or associations to provide some service within the community.” – Marcus.*

Qualitative inquiries such as this case study illuminated the idea that multicultural student organizations and program studies have a positive impact on involvement and success because they foster spaces for opportunities for students to exchange cultural knowledge and make an impact on communities that they connect with (Museus, Zhang, & Kim, 2016). Theme Three, envisioning increased program value, revealed how past scholars envisioned creating even more

meaningful and valuable experiences for future programming and program scholars. The researcher asked participants about how they envisioned the increased impact and value of the Carver Program. Participants expressed the need for more mentorship, whether peer-to-peer or faculty-to-student mentorship.

*“Having a guide as a mentor or a friend, just somebody that’s a current Carver scholar so that you have somebody that you’re working with. They’re doing the same thing, just maybe different disciplines or expertise. In addition to having somebody outside of a faculty member who has already gone through it and is able to connect them, I think that that’s beneficial to somebody like, for instance, myself in my career.” – Marcus.*

In addition, participants expressed the need for more engagement of faculty with the Carver Program:

*“I also think there should be a trained-trainer situation where that resource is trained for faculty that are working with Carver students. That way, when you have students with your advisor, they already know about the Carver program. That can show a strong success in the completion rate of a Carver student graduating.” – Marcus.*

The data showed that student success is not a linear process or ideology, and the definitions were heavily influenced by the unique experiences of the students. In addition, the data showed that the experiences and relationships between students, faculty, and institutional resources should work in alignment to assist in their journey toward student success. For example, one student suggested that faculty members who have advisees should have a checklist of checkpoints to keep the faculty engaged in the task of the program and to assist the student

toward degree completion. The overall findings guided by Research Question One were vital as they emphasized the participant's knowledge gleaned through participation in the program while also revealing suggestions for how the program could serve its scholars and strengthen its programmatic approaches through a holistic lens. It is critical to note that contextual factors impact and shape the various ways in which graduate students experience culturally engaging campus environments and might dictate the relationship between the campus environment and students' sense of belonging (Museus et al., 2017).

***Research Question Two: George Washington Carver Program Impact Success of Current GWC Scholars***

*How does the George Washington Carver Assistantship Program impact the success of current scholars?*

Research Question Two findings suggest that participants matriculate toward student success as program scholars when they are supported both personally and professionally. It is essential to recognize that the data collected from past program scholars should inform the second participant group, which is the current program scholars. Considering the new themes and subthemes that emerged from current scholar data, it does not negate the data gathered from past scholars. Instead, the new set of data from current scholars should be acknowledged as added value and context to the newly emerged themes and subthemes. There is an overlap in similarities to the experiences of current scholars; however, the most critical takeaway is to acknowledge the evolution of the program over time. The only existing knowledge from the previous participant group that was not used to inform the current student data was the experiences of career impact. However, from the experiences between both student groups, valuable knowledge was gained of the individual holistic experiences of newly implemented

programmatic initiatives and the impact on students' overall experiences in reaching student success. Overarching Theme One offered insight into the various *individual holistic pathways toward student success* taken by current students that define their current graduate school matriculation (see Table 6). Subthemes that emerged from Theme One were Valued Professional Network, Identity and self-reassurance, and Professional Development Experiences. Theme Two offered insight into the *CECE engagement indicators*. Theme Two subthemes consisted of six of the nine CECE constructs, which were cultural familiarity, cultural validation, humanized education environments, proactive philosophies, holistic support, and collectivist cultural orientation (see Table 7). In discussing the emerging CECE constructs in the Second Research Question, the model was even more instrumental in identifying various strategies to enhance underserved and underrepresented students' educational experiences and successes (Museus, Zhang, & Kim, 2016).

The Third Theme showcased current students *imagining increased value for future programming and future program scholars*. The subthemes that emerged consisted of envisioning increased scholar engagement, increasing college and departmental engagement, expanding Carver Program engagement, and lastly, scholars' utilization of program values for future scholars and overall future programming (see Table 8). Responses from participants who recognized different ways in which students access resources and receive support to reach their version of success while also supporting other program scholars toward reaching student success. The data examined in Research Question Two led the researcher to three overarching themes:

**Table 5.**

*Theme 1: A Holistic Approach Toward Student Success (Holistic Pathways)*

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<b>Subtheme</b>	<b>Participant Comments</b>
Pre- Grad Degree Experiences	<p data-bbox="613 411 1386 625">“I was told that Virginia Tech Graduate School was looking for graduates, and then Dr. Grayson also had the opportunity with the Carver Fellows program, so there was an online information session that I joined. Once I got accepted, then I was told that my funding would be coming from the Carver program.” – <i>Michael</i>.</p> <p data-bbox="613 667 1386 882">“I communicated early to my advisor when I said I was interested. I saw that as an opportunity where I can contribute in whatever way to your work. So, I wasn’t thinking of that as Carver necessarily funding my assistantship to do that, but I was just thinking of ways to just be acclimated to the culture.” – <i>Jayla</i>.</p> <p data-bbox="613 924 1386 1213">“I met Dr. Grayson through MANRRS. The cluster was held at Virginia Tech at that time, and I was introduced to Dr. Grayson. He saw that I was involved in MANRRS, so he let me know that if I wanted a master’s degree or PhD degree, he had funding. I formed a good relationship with Dr. Grayson. I would help him at career events when he wasn’t able to come to, and I would deliver a lot of the Carver program material.” – <i>Nia</i>.</p>
Identity & Self-Reassurance	<p data-bbox="613 1272 1386 1598">“You expect to come into a certain network, and you expect to have certain conversations. But then you realize that everybody is not coming from that background, and so those conversations change, and so that vulnerability is not there, or the vulnerability is more present. You don’t really want to just talk about HBCUs all the time because you want to make sure to include everybody. But the reality is, that’s probably the biggest challenge and hurdle that the group is facing.” – <i>Nia</i>.</p> <p data-bbox="613 1640 1386 1818">“There’s more of a program structure now where we’re identified as Carver students within a program, which then leads to us being able to identify as graduates of a program so that we know that we’ve completed something and contributed to something. – <i>Michael</i></p>

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“Being an African-American male at a Predominantly White University. Carver is grounding mentally when I come into the Carver seminar or when I’m meeting with Carver students off campus at some other event. I just have conversations with them about their experience, like current experience and things they’re going through. It could be positive or negative. Those are things that I could identify with. When I say it keeps me grounded, it just helps me because there’s somebody that can relate to my experience, so I know that I’m not the only one going through these things.” – *Daniel*.

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Scholar Development  
Experiences

“Essentially, you’re able to get that feedback if you are able to participate in the programming itself and present your research. Even through that feedback, you learn who the strong writers are within the group. You learn of who the strong researchers are, and then you can go to them for more help.” – *Demarcus*.

“At conferences, I’ve made certain connections with industry recruiters. Then, attending conferences, I see the same recruiter, and then we’re able to talk again and strengthen that connection because they remember me, and that made me feel good. I’m looking forward to things like that and meeting new professional connections.” – *Michael*.

“I really value the presentations and guest speakers that we’ve had about professional development. That has helped me navigate my program more, and I would also say there’s something to do with prepping for a conference. Because in order to go to the conference, you have to apply for a competition. And the competition usually relates to the research that you’ve done as a graduate student. So that also pushes me to round things out and keep working on it and refine the abstract that I’ve had and things like that.” – *Daniel*.

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**Table 6.**

*Theme 2: CECE Engagement Indicators*

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Subtheme	Participant Comments
Cultural Familiarity	<p data-bbox="597 411 1365 737">“Carver creates the space where you know that you have somebody to talk to outside of your college, and I think that that’s beneficial in many ways, so yeah, now that I think about it being exposed to other faculty and minority faculty and faculty that are engaging and care about those types of programs, allow you to have a better support system and network, where you feel like you could go outside of your department, which seems a little safer sometimes depending on your issues.” – <i>Nia</i>.</p> <p data-bbox="597 772 1365 989">“I’d say as far as like relationships go, there’s even been connections with alumni. People who were Carver alumni, whom I didn’t realize were Carver alumni at the time. But do a little snooping through LinkedIn, and you’re like, we have this connection. Then it became like a point of connecting with previous scholars.” – <i>Jayla</i>.</p>
Cultural Validation	<p data-bbox="597 1052 1386 1304">“Carver is allowing me to be a student here at this institution, and so I’m not only able to fulfill my research responsibilities here, but I’m also able to fulfill other community engagement opportunities and extracurriculars. I feel grateful for that because I feel even though a lot of them may be undergraduates, I feel they still look at me as someone that they can look up to like a vet.” – <i>Daniel</i>.</p> <p data-bbox="597 1346 1386 1745">“As students and as scholars, we like to inform each other. It gives you space for that because otherwise, you wouldn’t know that somebody is studying. You have access to scientists at that point. I think that’s a very good network to create as scholars, especially as minorities, because a lot of us aren’t in this space, and it’s hard to take science at face value of what you read in the newspaper and stuff. When you have those difficult questions, you can actually go to somebody to help you. I see that within various spaces where I’m working with my peers, I identify with them as far as racial status.” – <i>Jayla</i>.</p> <p data-bbox="597 1787 1386 1852">“There are department heads that are invested in the population of students and scholars, and they’ve worked hard</p>

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to get through other relationships outside of the university. You see that in that space, there was just a better network of the Carver students in general within the department because it was understood that that was its own network and its own space to be nurtured and valued within the department itself.”  
– *Nia*.

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Humanized Educational  
Environments

“Because Carver requires us to join MANRRS, I found that through MANRRS, I could heavily recruit HBCU students who are majoring in agriculture. To me, it was my responsibility to let everybody know of the opportunities available in higher education. One of the things that I’ve done a lot of recruitment, so I’ll probably say I have about three people that have come into the Carver Program from different universities outside of Virginia Tech that I’ve personally helped, and other people that I’ve been able to recruit from home, where we sent youth to college.” – *Nia*.

“It’s little things like that, and it doesn’t seem like it’s a big deal. But just spreading the word and having information readily available for students. I think that is a huge thing because we normally don’t have access to it. I know I wouldn’t have access. I’m not really on social media that often, and I know things like that are different for each student. Those things are really good, especially if it’s interdisciplinary or something like that. If things are going on in another department that I can take advantage of, then I feel like that’s really good, and Carver does do that since we all come from different areas.” – *Donya*.

“The conference funding is a really nice benefit because you have to have most of the requirements that you have to present to attend these conferences. Well, if I’m in a space that I have never been to before, I really want to be there as a participant in the conference, but now you want to be a presenter at a conference. So, it’s like a lot of pressure, and you can’t really enjoy it. You can’t understand the industry when you’re worried about presenting yourself, and you’ve never been in that space before. With the Carver program, you can go and observe. Then, you could just be stress-free in that environment and soak in more information. And that’s life-changing for most people when they go to a conference.”  
– *Jayla*.

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Proactive Philosophies

“The Carver program has been a really good resource with spreading the word about MANRRS, which is another

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agriculture organization I felt like that was really good, and I became a member of that, especially since the Carver program mentioned it at one of the seminars they have, I'm trying to think. There are several conferences and events, and Carver does a good job advertising to the students. Even some of the students, as we gather, we mention it over a chat that we have and things like that." – *Donya*.

"Our program director's role is just to help digest some of these transitions and affirm what you're feeling, and offer an array of different routes to go, or just like let the space to let that just be what it is. It's been an internal resource-sharing and also a research development process, even if I'm not doing something like dairy cows, for instance. It's just the idea of understanding that methodological approach, and maybe somehow, like in my qualitative research or whatever, I might come across dairy farmers. Now, I have that, that frame of reference that I can use toward other things that might not be like privy to the immediate scope of my research." – *Jayla*

"More resources have just been implemented like we took an assessment test to understand your skills, where you want to be, and how to develop your pathway into your career. It's just all those soft skills and hard skills that come with the assignments within the program. And that contributes to your professional development." – *Nia*.

"Different opportunities that are sent out, and those are things just like there's an upcoming youth event, and they need judges that were sent out. That's stuff that I'm interested in because I'm interested in working with youth. I haven't seen that opportunity through any of my other lists and networks here at Virginia Tech. That's just one example of an opportunity that Carver has sent out that I feel like I would not be able to take part in or wouldn't have knowledge of if I wasn't in the Carver program. I think just that constant stream of, hey, there's this going on, here's this event going on, and it's here, and you can take part in it." – *Daniel*.

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Holistic Support

"Even to this day, the faculty of [program], I still connect with them. Some of the faculty from the [program] are scholars within my building, so I see them at our gatherings. It really does help you connect with other faculty members, which could be beneficial in the long run, especially depending on

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your interests and the professors that you're introduced to.” – *Nia*.

“I will say that I’ve really appreciated the program director’s presence in cultivating the space. It’s been a range of professional development advice, as well as personal development and navigating different spaces. It’s been a really great thing having her in that role, and working with faculty has been good. Just taking the things in your head is like, am I crazy? Even the same way with different students. Those things in your head are like, is that right? Is that a little off? Then just being able to navigate that through a conversation, which I think is really helpful, because like sometimes things can be so solution oriented that you can’t just have the space to just like process it and let it go.” – *Jayla*.

“I have unique experiences, of course, being an African-American male, I should say. The program director has been an excellent support system. I can go talk to her about different things that are going on, different experiences that I have had, and she’s seen before, and she can give me advice and guidance on how to navigate those things.” – *Michael*.

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Collectivist Cultural  
Orientations

“I don’t have any family that has done this before, so when I look for support, my family can give me emotional support. Other than that, I look to my academic colleagues to help motivate me and give me advice on everything else that’s in front of me because they’ve been on the side before. That’s one resource that helps me from Carver.” – *Daniel*.

“I don’t feel like I have a greater sense of connection and teamwork in my department as if I know what other people in the College of Agriculture and Life Science are doing overall. Like, I feel like I’m very much in this nebulous space where, like, I know all the folks in my department, we’re all moving real fast, and we’re all going doing different things, but as far as a larger college as a whole, if it wasn’t for Carver, I really wouldn’t know just the range and scope of what folks are doing.” – *Jayla*.

“I’m so happy it’s a program now; we can identify it as not just a fellowship, but a program where people are expecting to have takeaways from it.” – *Nia*.

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**Table 7.**

*Theme 3: Envisioning Increased Program Value*

Subtheme	Participant Comments
Increase Scholar Engagement	<p data-bbox="613 415 1365 600">“I would say, to be honest, it hasn’t been as much as I feel like it could have been. But I can mention, again, I’m a little older, so resume building is not super helpful for me, but it could be for some of my other peers and things like that.” – <i>Donya</i>.</p> <p data-bbox="613 636 1393 926">“I would like to see some service activities through the program where all the Carver scholars get together and do some type of service activities throughout the semester and throughout the year out in the community. I think it’s important when you live somewhere, a lot of us have moved here from other places. I think it’s important when you live somewhere to get to know at least some aspect of the community.” – <i>Michael</i>.</p> <p data-bbox="613 961 1393 1367">“I would like to see maybe more engagement pieces, maybe more support in just a space, in general, that we could call our own as a program. We have to have more basic resources that contribute to our research, such as computers with all the programming on them, because it’s not affordable. Things that will, I guess you would say, support working spaces more. If we were able to just have moments where we can help each other with our research, like the actual practical things that need to be done in research, and not just hearing the presentation. Stuff like that could foster more interactions.” – <i>Nia</i>.</p>
Increase Departmental Engagement	<p data-bbox="613 1388 1365 1824">“There should be more obligations put on the faculty members to support those groups that bring in that type of support for the department as well. Because that money goes to support the department, then you see a better-cultivated space for those students. Even just that alone created some conflict with other students. To feel like, well, why we don’t get that type of treatment? That’s where we come in as scholars to educate them. The same way that the scientific scholars from [program] will help give us more knowledge we got to help our other non-minority peers understand the processes of having programming and spaces for a particular group.” – <i>Nia</i>.</p>

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“I think there needs to be University buy-in; there needs to be University trust. There’s this constant ambiguity: at what point will this cease to exist? The program can’t be successful if it’s constantly under scrutiny by the university. Tell them I said that. Because it can’t just be this one off of, we support student success, and we support student diversity, and there’s always this fear that at any point it will cease to exist if they’re creating affirming spaces. If the point is to create spaces in which we’re having more diversity in our student portfolio. What’s necessary to keep Carver around for current students and future students is the university.” – *Jayla*.

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Expand Program Network

“If I’m imagining this scenario. I like in-person stuff, so I imagine networking, a tabling affair, or a congregation of past Carver scholars, maybe prospective scholars, and just like that whole opportunity to convene and share. We can all do research, but a lot of those things that really do inspire success are things that come up just from mundane conversations. Just being able to share your success, your grief, your confusion, or whatever. All those things are instrumental points to answering that question that you didn’t even know you had.” – *Jayla*.

“Broader networks are like that networking aspect; sometimes it helps to hear other people’s stories, such as alumni of how they got to where they’re going and stories of success, stories of failure, aha moments, all those different ways in which people are just up navigating the world. That’s something that I mentioned before, too, that I think is just cool, and I appreciate the folks who have shared their resources on campus, but they’re talking about their own personal journeys. That emphasis on a personal journey has been really cool because then you feel more like an agent on your own.” – *Donya*.

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Scholar Maximize Program Value

“What I would tell future scholars when navigating their identity on campus is to lean into the spaces in the places and the people who are rooting for your success. It might not feel like that per se. There’s still going to be challenges in people rooting for your success. Go in the spaces where people are encouraging you to challenge yourself, but also encourage you to find that on your own terms.” – *Jayla*.

“Eliminate any of this impostor syndrome stuff and lack of self-confidence. You need to think that you’re already where

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you need to be, but you're just trying to maintain that in a way." – *Daniel* .

"Carver scholars really have to understand that they create the space in the experience and that they should invest in that space. They should advocate for space within their department, and they should advocate for understanding within their department. This is what the program is, this is what I'm bringing to the department through this program, and this is what I expect as a participant in the program because I think that's where a lot of people struggle the most with their departments." – *Nia*.

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### ***Discussion Research Question Two***

Research Question Two offered insight into the experience of current Carver scholars and the program's impact on student success through a holistic lens and culturally engaging environments. Museus (2012) suggests that a model like CECE should approach student groups holistically throughout their graduate matriculation, up to their degree completion. Institutions and institutional programs have the power to transform campus environments to better support and meet the needs of the students, specifically graduate students. The findings from Research Question Two revealed three themes: Holistic Pathways, Increasing program value, and campus-shaped experiences. The findings revealed an awareness and understanding of what impact the program has on students today, as students are actively in the program and navigating their academic programs. Participants were asked to describe their experience in belonging to the Carver program. Student success was met in that current students benefited from the resources and access to enhance their academic experiences. Students also defined success by discussing the holistic nature of their participation in the Carver program. Students expressed the program being grounded in the identities of the students.

*“Carver is grounding mentally when I come into the Carver seminar or when I’m meeting with Carver students off campus at some other event. Just having conversations with them about their experience. It could be positive or negative. Those are things that I could identify with. When I say it keeps me grounded, it just helps me because there’s somebody that can relate to my experience, so I know that I’m not the only one going through these things.” – Daniel.*

This theme also revealed the strategies and program initiatives that are currently serving its scholars and recommended areas of improvement. In addition, as discussed when introducing Theme Two, there was a focus on examining the cultural engagement of the program. Of the six indicators that emerged from the data, cultural familiarity was discussed. Students discussed spaces where they were able to make connections with other faculty and students who share similar backgrounds and identities. Students expressed:

*“Carver creates the space where you know that you have somebody to talk to outside of your college, and I think that that’s beneficial in many ways, so yeah, now that I think about it being exposed to other faculty and minority faculty and faculty that are engaging and care about those types of programs, allow you to have a better support system and network” – Nia.*

As graduate students, even being members of a structured institutional program, the students had complete ownership of establishing what their graduate experience consisted of toward enhancing their educational experiences toward success. It was evident that even with the necessary programmatic initiatives in place and program requests from students, every journey and experience was completely different. Additionally, evidence from the data also revealed that for programs like Carver to exist and be sustainable, there must be partnerships and alignment

among all stakeholders involved – the institutional level, college, departments, and programs – to work collectively in supporting and meeting the needs of students who make up these programs. The researcher asked participants about their relationships and the support they have received from faculty through their participation in the program. The participants expressed that they have built relationships with faculty program directors in Carver-like programs through their participation in Carver.

*“I will say that I’ve really appreciated the program director’s presence in cultivating the space. It’s been a range of professional development advice as well as just like personal development and navigating different spaces.” – Jayla.*

Through those fostered relationships, students found support beyond academics through faculty. Creating a space in which students have access to sources of support is critical for ensuring students access to information and support is available for ensuring student success (Museus, Zhang, & Kim, 2016). The researcher also asked participants about how they envisioned the perfect program that would serve them and their peers toward reaching their version of success. Participants discussed the importance of collective collaboration among the institution, departments, programs, and faculty.

*“I think there needs to be University buy-in; there needs to be University trust. The program can’t be successful if it’s constantly under scrutiny by the university. Because it can’t just be this one off; we support student success, and we support student diversity, and there’s always this fear that, at any point, it will cease to exist. If they’re creating affirming spaces. If the point is to create spaces in which we’re having more diversity in our student portfolio. What’s necessary to keep Carver around for current students and future students is the university.” – Jayla.*

With an understanding of these different stakeholder groups within the university system, the CECE Model should facilitate the discourse and thinking for the type of environment university leaders, and educators should invest resources in cultivating on and around campus (Museus, 2012) This leads to the Third Research Question to discuss the experiences of faculty in a supporting role of the Carver Program and program scholars.

***Research Question Three: Experiences of Faculty in Supporting the George Washington Carver Assistantship Program and Program Scholars***

*What are the experiences of faculty in supporting the George Washington Carver Assistantship Program and graduate program scholars?*

Research Question Three led to three overarching themes: Faculty Support Dynamics and Engagement, Faculty Experience in Scholar Development, and Faculty Define Student Success. Theme one suggests the perspective and experiences of faculty engaging with the Carver Program (see Table 9). Participants were asked questions about their knowledge of the relationships between their departments. The majority responded that there was no established relationship between the departments and the program. They also shared that in their role as faculty, there is minimal to no communication with the program unless they are receiving communications from their Carver advisee. Funding is probably the most critical to supporting Carver scholars. Theme two suggests that there are factors that impact faculty in scholar development (see Table 10). The majority expressed concern about the excessive workload asked of Carver scholars. They also discussed the work and value that goes into effective communication and building trust. Theme three offered insight into how faculty define student success and ways that they support scholars in reaching success (see Table 11). The data suggested that faculty define student success through self-advocacy, which means students'

ability to show up for themselves and their duties as scholars and graduate students. They defined success through students' ability to attain a degree, enter the workforce, and secure a job. It is evident in the research that faculty have a distant relationship with the Carver Program, and the CECE Model was not useful for measuring their responsibility or role in contributing to fostering culturally engaging campus environments. This does not negate their role in fostering culturally engaging environments in other capacities around campus, but considering their relationship and engagement with the Carver Program, data revealed very little to no evidence of holistic strategies contributing to the success of scholars. Their program engagement limits their role to program support for program scholars.

**Table 8.**

*Theme 1: Faculty Support Dynamics and Engagement with Program*

<b>Subtheme</b>	<b>Participant Comments</b>
Program & Department Engagement	<p>“I don’t think we interact like if I weren’t an administrator. Usually, I reach out to our faculty, and I try to recruit for the Carver program. It used to be pretty easy, but it’s not now, but if I see an applicant that would fit in that, the grad program coordinator and I will reach out to the faculty that’s interested in working with them and the student who applied and help them apply for the Carver program. I’m not sure, I’d be that involved if I were just a faculty member that happened to have a grad student every once in a while.” – <i>Dr. Cluster.</i></p> <p>“I’ve had different levels of engagement, I think, in terms of the program; I’ve tried to attend things as invited. I think I’ve been invited less in the last few years, so I haven’t really engaged as much. My understanding there’s communication between the department head and the Carver program, but it’s faculty very little. I think as I want to use, if I want to encourage a student to participate, I have to look up the information myself. I think the lack of communication between the program and the advisor in the department hinders advising the students participating</p>

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because we really don't know what they're doing." – *Dr. Denson.*

"The involvement has been more from a perspective of I spend time talking to them about what their commitments and their activities and their experiences are." – *Dr. Rendon.*

"I'm not sure if there is like an official relationship or a set communication that happens there. Like I said, I was just made aware of it by my director." – *Dr. Baxter.*

"As a faculty member, I know that I've had my students apply to the program directly through Carver, and I know that's always been part of the admissions process in terms of looking at available funding and matching funding, but I don't know if there is a formal relationship beyond placing students." – *Dr. Sanders.*

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Faculty and Program  
Engagement

"I've never had much interaction with the program directly. It's been mostly like, right at the start, it was agreed upon that this would work out that way. And then it was putting the student in contact with the Carver program itself, and then it went on from there. And basically, I'm not involved much at all." – *Dr. Baxter.*

"I feel like, as an advisor, I'm not privy to all the communications. I feel there's more communications directly from the Carver program to students, which then I learn about Carver things through my advisees. I don't know that I've had communication directly through the department about the program. I know that at some point, I guess that was last year, they implemented more of a formal contract that I remember reviewing with my advisees and signing. But I haven't had much communication through the department about the program.." – *Dr. Sanders.*

"Maybe from my perspective as a faculty member and an advisor versus a departmental administrator, some flow through communication on what's happening in the program, what are some challenges and successes, and a little bit more on what our role as advisors should be beyond just what we know in terms of academic advising, that would be typical of all students. Are there things that we should be doing to better advise Carver students or

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make sure that they're meeting program expectations and things like that? I think that type of communication will be helpful. I don't know that I've seen much of that, but I think that there could be more relationship there." – *Dr. Sanders*.

"If the program wants advisors supporting students doing different professional development opportunities, we need to know about them, and we don't. If there's any activities they want us to be doing, we don't know about anything we can do to help. We can't back up or reinforce the value of things going on in Carver because we don't know what's going on in Carver." – *Dr. Denson*.

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Faculty & Student  
Engagement

"I feel there's more communications directly from the Carver program to students, which then I learn about Carver things through my advisees. I don't know that I've had communication directly through the department about the program. I know that at some point, I guess that was last year, they implemented more of a formal contract that I remember reviewing with my advisees and signing. But I haven't had much communication through the department about the program." – *Dr. Sanders*.

"In terms of engagement with our program scholars, we are working together for the common goal of getting them their graduate degrees. Regardless of what's going on. We have weekly meetings that we schedule and have set up. Then it's checking in with them about how classes are going and checking in with them about what's the next task that you need to complete to keep moving yourself toward that goal of getting your degree." – *Dr. Rendon*.

"Unless a student tells me during my weekly meetings what they're doing in Carver, I have no idea what they're doing. I can't really encourage them or support them because I have no idea what I'm supposed to be encouraging and supporting." – *Dr. Denson*.

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Funding Source

"The student would be on the department funding or the school. And then the second year would be on Carver. And then the third year back on the school and the fourth year back on Carver. So there was definitely clear communication required to make that work. Obviously, just covering the stipend and tuition, that's the most important part." – *Dr. Baxter*.

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“Carver helps me helps them only through the financial piece. I don’t think there’s anything else. There’s nothing else that’s given that’s like offered to me or available to me that I know of to help them. It’s really on me to be responsible for that.” – *Dr. Denson*.

“For the faculty, it’s probably the money. We have money because, in our department, we only take students who have funding and have a match with faculty. Programs like Carver are just another tool in my toolbox to help me get more grad students in here because it’s that little bit of funding that maybe someone would like another student, but they don’t have full funding. But if I can get them some of this, then they’ll go for it. I think faculty is probably the most.” – *Dr. Cluster*.

“The financial piece of it is huge. We’re in a position right now that’s frustrating and strange because with there not being a federal budget, then that means that a lot of our grant applications are in limbo, and we don’t know if we’re going to have funding for graduate students. Any opportunity that we have to give a student a concrete answer about an assistantship, particularly when things like this happen, is huge for not only the department and the researcher but then, of course, for the student because if it wasn’t for that program or one similar to that, then there would just be no opportunity to fund a student and no opportunity to bring them in.” – *Dr. Rendón*.

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**Table 9.**

*Theme 2: Factors That Impact Scholar Development*

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<b>Subtheme</b>	<b>Participant Comments</b>
Program Ask of Scholars	<p data-bbox="617 430 1372 1123">“I sometimes feel like my student deserves to be here. And I happened to be saving some money by getting them into the Carver program. So, in that sense, it’s now actually kind of given a bit more of a burden on them, but not that they have a problem doing that stuff. I think they enjoy participating in the Carver program events, but sometimes, I think, it’s a little unfair that there’s this added expectation added onto the student to participate in these events, when they didn’t necessarily sign up for it. And indeed, he, by himself, is worthy of just being part of our school and my lab. And so yeah, it ends up, like I was saying, it’s kind of saving me some money, but now that student has to perform some duties to participate in that. Although, again, I do think he gets stuff out of those events in those participations, like getting professional development, which is great. So, in that case, right, it’s not necessarily a negative thing. But I don’t understand why there’s this expectation of participation that’s not necessarily something they signed up for?” – <i>Dr. Baxter.</i></p> <p data-bbox="617 1165 1372 1449">“One thing I do wonder is if I’m a student and I’m in a Carver or Carver-like program, I’m pretty sure they’re supposed to go to both of those meetings. Then does it, at some point, get to be too many, too much? I just don’t know. It would be something to be aware of, at least from your end. If you know a student is in two or three of these organizations, how do we make sure that they don’t get overwhelmed.” – <i>Dr. Cluster.</i></p>
Building Trust	<p data-bbox="617 1480 1372 1659">“Communication is huge. That’s been number 1. I rely on the student to be telling me all the things that one that they’re working on. I rely on them to tell me what they’re struggling with and to be honest about it, and that’s not always easy.” – <i>Dr. Rendon.</i></p> <p data-bbox="617 1701 1372 1869">“We’re about to try this with a student, is an agreement between the faculty. A contract or expectations document. We’re actually trying that right now with one student who was having a problem with another faculty member, they didn’t see eye to eye. We’re moving this student within the</p>

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department to different advisors and we're going to actually have an expectation document for both sides. The student is saying, here's what I'd like to see from my advisor, and the advisor is saying, here's what I expect from my grad student. I think that could help a lot because I think my first Carver really struggled." – *Dr. Cluster*.

"I think there's a lot of work that I need to do with my Carver students. Everyone has been African-American, and some of them have come from HBCUs, some have come from PWIs, but kind of building that relationship so that I'm a trusted person that as they're struggling because, as you know, research is hard, especially the kind of research we do where your positionality matters. They need to work through that and recognizing that there's some pieces of that that I can't help with, but that I want to build that relationship of trust so that as we're working through problems of practice and all of that, that hopefully, we have that foundation of a relationship where we can move the work forward." – *Dr. Sanders*.

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Career Development

"One of my current students is applying to vet school, and it's not working out so far. It's something that I know weighs heavy on them and is a source of stress. Talking to them about alternatives is using what contacts or background information I have from my past interactions with other faculty and with industry professionals, talking to her about her alternatives. If this doesn't work out, what's going to be the next step? What do you think you'd like to do? What are the steps that you can take now to make sure that do you end up in a profession that makes you happy regardless of whether school eventually works out or it doesn't? Using those resources and those connections that I've built over the years and the knowledge that I have from doing those things." – *Dr. Rendon*

"I would say probably half of our PhDs, if they want an academic job, they tend to find them. It's not like they're trying to find academic jobs, and they're not there. It's more that they've decided they don't want to do that. It almost seems to me like, at least for mine, it's not like I'm really helping them all that much to find their job. By the time they're graduating, they're good enough that they're almost deciding where they want to get a job, and it's all about connections also, they're getting jobs with either

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people they did interns with or people they worked with or people we met at conferences, things like that.” – *Dr. Cluster*.

“So there’s just a lot of equipment that I was able to acquire using my startup funds, for instance. So, set up all the things that are required to do the experiments that the students are working on. We’ve had support from a center in the college that that includes faculty from different departments. And along with that faculty come to their students, and then there’s opportunities there for the students to get small grants funded or travel funding, and some professional development activities and stuff as well.” – *Dr. Baxter*.

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**Table 10.**

*Theme 3: Faculty Define Student Success*

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<b>Subtheme</b>	<b>Participant Comments</b>
Self-Advocacy	<p>“I think success looks like the students meeting their own goals, and that looks different for different students. I have advised several master’s students through Carver, some of whom came through undergrad programs, some who are switching from more of a science undergrad that were interested in switching, but either way, I think for a master’s student, success really looks like kind of growing into a scholar.” – <i>Dr. Sanders</i>.</p> <p>“There’s just the fact that they’re that they’re developing professionally, right, that they’re learning something and learning new skills, gaining new knowledge.” – <i>Dr. Baxter</i>.</p>
Degree Attainment	<p>“The student completes the program and that they get their degree, they feel good about how they got their degree. There’s times when a student will go through a program and they’ll maybe have a really overly difficult time at the end, and maybe they got their degree, but they don’t feel real good about how that time ended or how they ended up with that degree. Thankfully, that doesn’t happen very often, and I’ve probably only had that happen once before. But I want a student to get their degree that has been their goal for the time here.” – <i>Dr. Rendon</i>.</p>

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“Well, for me, if they graduate.” – *Dr. Cluster.*

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Job Security

“Building a network, right, so knowing colleagues throughout the field, and eventually, hopefully, that that all comes together to then help them find their next job or their next acquisition.” – *Dr. Baxter*

“Success is if they are able to apply for and successfully acquire a position that is what they wanted. It was that their career goal or something close to it. Sometimes different opportunities come up after you get started that you didn’t even know where choice is. It wasn’t necessarily your first thing you thought of, but now it’s a thing.” – *Dr. Denson.*

“The most recent one PhD student, in the end, engineering wasn’t for them and not by my choice. We worked really hard to find another place for them at Virginia Tech because they can leave, they can go somewhere else if they want to. Even though they didn’t succeed in the research working with me, which would have been ideal, they still moved to engineering education, finished their degree, and now has a job that she likes. I still call that success, even though they couldn’t pull it off where they first started. It just wasn’t a good fit for them.” – *Dr. Cluster.*

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Fulfilling Graduate Duties

“Being able to conduct their research in a way that the resources are available to them. So, for instance, we do lots of lab work. So there’s right the availability of equipment and all that kind of thing.” – *Dr. Baxter.*

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### ***Discussion Research Question Three***

In findings related to Research Question Three, participants shared their past and current experiences engaging with the Carver Program and program scholars. The findings presented revealed that there were many gaps between faculty and the program. Theme One presented insight into the relationship between the Carver Program, faculty, and departments that partner to support students. The researcher asked faculty participants to discuss their engagement with the Carver Program. The participants expressed that their engagement with the program was very limited.

*“The involvement has been more from a perspective of I spend time talking to them about what their commitments and their activities and their experiences are.” – Dr. Rendon.*

In addition, oftentimes, the faculty and overall department’s communication was based on the need and request for funding. Faculty participants emphasized the value of funding to support students.

*“For the faculty, it’s probably the money. We have money because, in our department, we only take students who have funding and have a match with faculty. Programs like Carver are just another tool in my toolbox to help me get more grad students in here because it’s that little bit of funding that maybe someone would like another student, but they don’t have full funding.” – Dr. Cluster.*

With the CECE Model being a tool used to foster change on university campuses, the model could also be instrumental for university leaders such as faculty to better understand the experience and outcomes of students with diverse backgrounds and to further assess areas of improvement (Museus, 2012, p. 219). There were limitations presented for faculty participants, such as the disruption of Carver’s weekly programming on students’ academic duties or the lack of communication between the department, faculty, and scholars. Theme Two suggested factors that impacted the faculty’s ability to support scholars in their development. Participants were asked about strategies or approaches they found most important in supporting their students.

*“I think there’s a lot of work that I need to do with my Carver students. Everyone has been African-American, and some of them have come from HBCUs, some have come from PWIs, but kind of building that relationship so that I’m a trusted*

*person that as they're struggling because, as you know, research is hard, especially the kind of research we do where your positionality matters. I want to build that relationship of trust so that as we're working through problems of practice and all of that, that hopefully, we have that foundation of a relationship where we can move the work forward.” – Dr. Sanders.*

Participants expressed that building trust and communication with their students is the most important, but oftentimes, it is a challenging task, considering the cultural differences.

*“Communication is huge. That's been number 1. I rely on the student to be telling me all the things that one that they're working on. I rely on them to tell me what they're struggling with and to be honest about it, and that's not always easy.” – Dr. Rendon.*

Theme Three revealed the ideas in which faculty saw and defined success in their students. The researcher asked each faculty participant to define student success based on their experience and as advisors advising Carver scholars throughout their careers. The participants expressed that student success is significantly defined by a student's ability to graduate, meet their program requirements, and obtain job security.

*“I think success looks like the students meeting their own goals, and that looks different for different students. I have advised several master's students through Carver, some of whom came through undergrad programs, some who are switching from more of a science undergrad that we're interested in switching, but either way, I think for a master's student, success really looks like kind of growing into a scholar.” – Dr. Sanders.*

Faculty expressed their experiences, allowing the students to guide themselves in their career search. Faculty seemed to be hands-off in their approach to assisting scholars in securing jobs.

*“Building a network, right, so knowing colleagues throughout the field, and eventually, hopefully, that that that all comes together to then help them find their next job or their next acquisition.” – Dr. Baxter*

Findings also revealed that there is value in the program offering a space for building community outside of academics and being in community with students who hold similar identities. Although these limitations were presented, the findings breed an opportunity to implement processes and procedures that support all stakeholders involved, the program, departments, students, and faculty.

## **Summary**

Chapter Four presented study findings from the semi-structured one-on-one interview conducted with the five past program scholars, five current program scholars, and five faculty. The purpose of this qualitative case study was to investigate the impact of the Carver Program on scholars’ graduate school matriculation toward reaching student success. The researcher employed the CECE Model to frame the study to better understand what initiatives should be in place to ensure that each student’s needs were met and that scholars underwent a holistic and culturally engaging graduate experience when working with underserved and underrepresented groups. This chapter presented the holistic experiences of both student groups based on the years they spent in the program. The data revealed similar experiences across student participant groups even as the programs evolved and the transition of directors in their strategies and styles toward leading the program compared to faculty. Neither presented to be worse than the other but instead provided more context into how the students navigated their graduate experiences

with the Carver Program with additional access to community, resources, and program support. Faculty participants presented a different perspective on how they viewed the Carver Program. Many of the faculty saw the program as a funding source, and their engagement was contingent upon the student's academic matriculation toward degree completion.

Each participant group acknowledged their individual experiences and engagement with the program. It is important to reemphasize that the CECE Model engagement indicators emerged only for the student group participants. This observation did not take away from the indication that engagement did not exist between the advisor and advisee; however, it was an indication that there were major gaps in how faculty saw the program as it relates to serving the student through a culturally responsive and relevant lens. Data also showed that some faculty were very invested in building trust and communication with their scholars, which, when established, could be directly related to the CECE Model's holistic support indicator. However, there was not enough data presented to measure and support the faculty's role and attitude in fostering culturally engaging campus environments toward the Carver Program. Additionally, the faculty did not have enough programmatic context to contribute their perception of the environments that essentially shape the student's experiences and overall success (Museus, 2014a). Kinzie and Kuh (2017) recognized student success. Students discussed the various ways in which they reaped the benefits of their education experiences through participation in the Carver program. Those experiences encompassed those from an academic and non-academic lens. Past scholars, current scholars, and faculty each provided plausible insight into student success through their individual lenses and the position they hold in the academic space. Student success is not limited to specific academic experiences but instead encompasses an array of inputs that shape the overall educational experiences.

## **Chapter 5:**

### **DISCUSSION**

The purpose of this qualitative case study was to explore the impact of institutional programs on graduate students in STEM disciplines' graduate success and matriculation toward degree attainment. Additionally, to investigate and glean more insight into the program and program participant experiences, this case study took the perspectives of three participant groups: past program scholars, current scholars, and faculty. This final chapter will connect the findings to the CECE Model framework. This chapter will introduce the problem statement and its connection to the theoretical framework, reemphasize the research questions that guided the study, the significance of the study, its limitations, and the areas for future research, and provide a summary to highlight the entire study.

It is important to emphasize that in the discussion section below, the findings for research questions one and two from the student participant groups were combined. However, students experienced the Carver program at different stages of the program, and past scholars' data-informed current scholars by providing insight into the evolution of the program and the iterative patterns and themes that emerged between both participant groups. The faculty participants were discussed separately, and the data revealed that their role and engagement with the program were distinctively different from the experiences of the student groups.

This chapter encompasses discussions and potential research possibilities guided by the research questions listed below:

*How do institutional support programs foster a culturally engaging campus environment for underrepresented and underserved graduate students in STEM disciplines toward reaching student success?*

- 1) What are the experiences of George Washington Carver Assistantship Program's past graduate scholars as program participants?
- 2) How does the George Washington Carver Assistantship Program impact the success of current scholars?
- 3) What are the experiences of faculty in supporting the George Washington Carver scholars?

### **Discussion of Findings**

Gaining the necessary insight into a holistic lens of graduate students' experiences through a qualitative case study reveals knowledge about various aspects of the graduate experience that are specific to the student and institutional programs (Collier & Blanchard, 2023). While each participant group discussed their experiences from engaging in the Carver Program, each of the three common themes that derived from the student's participant groups were key factors in how students saw themselves, the program, and future Carver programming throughout their graduate journeys: (1) A Holistic Approach to Student Success; (2) CECE Engagement Indicators; and (3) Envisioning Increased Program Value. For the faculty participant group, the three overarching themes were prominent factors in defining student success from a faculty perspective and how they benefit from the program: (4) Faculty Support Dynamics and Engagement with the Program; (5) Factors that Impact Scholar Development; and (6) Faculty Define Student Success.

The findings and results of this study sought to reveal and suggest insight based on the past and current experiences of students in the program; the researcher discovered how holistic the approach is in serving its students. In addition, the researcher discovered to what extent students' needs were met as Carver Program scholars and where their needs may not have been

met toward student success based on their own holistically defined meaning. For faculty, as they were seen as support resources considering their role and engagement with the program was limited, the analysis revealed factors that highlighted the differences in how students saw the program and their student success compared to how faculty saw the program and student success.

### **Implications**

Research Questions 1 & 2: Examine the Experiences of George Washington Carver Assistantship Program's Past Graduate and Current Scholars

#### ***Theme 1: A Holistic Approach to Student Success***

Despite the differences in life experiences, academic interests, and overall program matriculation, participants described similar feelings and experiences of how they saw themselves and their experiences at Virginia Tech as a Carver Program Scholar. Past and current program scholars found their journey into Virginia Tech as Carver scholars was uniquely curated based on their established network and support systems both inside and outside of Virginia Tech. Participants revealed that as it related to their graduate matriculation, they were led and guided throughout their unique journeys toward degree completion. Through various practices and approaches that contributed to their success, both student past and current scholar participant groups suggested that the extent to which a student reached student success was less contingent on their academic performance and more contingent on the factors and experiences outside of the classroom, labs, and overall academics.

Graduate schoolwork in STEM disciplines is understood to create challenges and sometimes discourse. However, it is the culturally relevant practices and culturally responsive systems that foster holistic spaces and environments for students to navigate those challenges

and discourses more efficiently (Muesus et al., 2016). Many of the past scholar participants described their experiences with the program as being much less of a program structure and only coming together once a month for check-ins. In efforts to triangulate the data, past scholars informed the current scholars' experiences. For example, past scholars have fewer programmatic initiatives; however, current scholars have expressed the impact of Carver encompassing more programmatic components. That revealed to the researcher how the program had evolved, offering more programmatic initiatives that allow students to feel part of a space and community that serves them in every aspect of their graduate matriculation.

During the time they spent with the program, all participants described an authentic love for the program, which provided them with a space of community to form relationships and connections and better navigate their overall graduate experiences. One student revealed that Carver gave them the stability to maintain a social life and that the connections they made were most important to them in not giving up on their programs. In addition, also part of the participants' holistic approach to defining student success was the idea of empowerment. Students expressed that from their identities, it was easy to feel misplaced or out of place with their peers outside of Carver but seeing their Carver peers matriculate through their programs prompted them to establish a sense of self-efficacy and empowerment of conquering their graduate experience as a Carver scholar.

Additionally, past program scholars participated in this interview as individuals who were removed from the Carver space, whether that was because they reached degree completion or simply, under whatever circumstances, could not complete the program. However, part of the Carver mission and vision is not only supporting students through their graduate journeys but also preparing them for the journey following degree completion into a career. Past scholars

expressed the skills, values, and relationships that assisted them in their current professional roles. There was an overlap in the experiences of past and current scholars and how they perceived their experiences in the program. The difference in the experiences heavily relied on the structure of the program. However, both student participant groups defined holistically what student success meant to them based on their past experiences, fostered network, access to resources, and overall personal and professional needs. Student success is not a linear process; it is defined by factors relevant to the experiences and access to resources both inside and outside of the classroom.

### ***Theme 2: CECE Engagement Indicators***

Theme two revealed the program cultivated a culturally engaging campus environment. When asked, participants discussed opportunities they had to connect with peers and faculty as scholars. Past and current scholars were also asked about opportunities they had to engage with students from different backgrounds. Participants were able to discuss some of the resources that were presented for students to explore culturally engaging opportunities, whether that had been through Carver or obtained through Carver through the network. This study was intentional about revealing the alignment and correlation of experiences from past scholars to current scholars. Past scholars informed the data presented by current scholars. The data was informative in telling the story of not only the students but the program. Without the students, the program does not exist. Therefore, it was critical to acknowledge the idea of telling the story of each student while also revealing how this program is designed and structured to holistically support these students who held these unique stories and experiences.

The CECE Model for measuring student success is grounded in the notion that institutions and institutional programs can cultivate a campus culture that holistically reflects

and responds to diverse backgrounds of students to foster better campus environments and conditions for diverse student populations to thrive and be successful (Museus, 2014a). In applying the CECE Model indicators to the findings from both student participant groups, the culturally relevant and responsive indicators were not all present throughout the Carver program. In utilizing the CECE Model to format the findings and results, the researcher found three indicators from the experiences of past scholars. The culturally relevant indicators consisted of cultural community service and cultural familiarity. The third indicator was proactive support, which is a culturally responsive indicator. For current scholars, six indicators emerged from the data; culturally relevant indicators consisted of *cultural familiarity* and *cultural validation*. The culturally responsive indicators consisted of *humanized educational environments*, *proactive philosophies*, *holistic support*, and *collectivist cultural orientation*. In both student participant groups, there was an indication that cultural programming was a part of Carver's program initiatives. However, data from past scholars and current scholars revealed that there was a significant difference in the intentionality of employing more culturally relevant and responsive internal and external programming opportunities.

### **Culturally Relevant Indicators.**

In both student participant groups, several examples provided insight into the levels at which the program culturally engaged the underrepresented and underserved populations that made up the Carver program. The culturally relevant indicators specifically examine the ways institutions and institutional program environments are relevant to the cultural communities, backgrounds, and unique identities of diverse student populations (Museus, Shiroma, & Dizon, 2016). Past scholars expressed the *cultural familiarity* indicator was prevalent in their experience. Cultural familiarity refers to the spaces that are cultivated for students to connect

with peers, faculty, and staff who understand their cultural background and identity. The researcher asked about opportunities to connect with faculty and peers. Past program participants expressed that through Carver, they found access to other institutional programs that allowed students to connect with other faculty and students who share similar identities, as well as connect with other institutional programs that served undergraduate students with similar identities and backgrounds. Past scholars also identified *cultural community service* as a key relevant indicator toward engaging environments. Participants expressed that they worked with undergraduate institutional programs that served diverse populations to do service work around the community during nationally known days that recognized different cultures.

In addition to the overlap of cultural familiarity identified by past and current scholars, current scholars also identified *cultural validation* as an indicator that emerged from the culturally relevant dialogue. Cultural validation is considered the campus cultures that validate the cultural backgrounds of diverse student groups and identities. Participants expressed that Carver established a space that allowed them to inform each other of their interests, who they were and their experiences as Carver scholars. The Carver program intentionally created a space for students to feel empowered and validated in the knowledge and identities they brought to the space. While not all the five culturally relevant indicators emerged in the data, evidence still showed that there were improvements to the development of more program initiatives in creating spaces for students to connect through cultural engagement as a key component and contribution toward student success.

### **Cultural Responsiveness Indicators.**

Cultural responsiveness refers to the institutional systems that are employed to which campus environments respond to students' needs through these systems (Museus & Smith,

2016). Past and current scholars identified examples that revealed *proactive philosophies* as a prominent indicator of cultural responsiveness. Proactive philosophies are the support services, resources, and information that are brought to the students, rather than the students having to go find those resources. Participants expressed that Carver provided resources and workshops that offered information and resources not only at a program level but also at an institutional level. In continuation of examining the prominent indicators that emerged from the data, current scholars provided examples and experiences of the remaining three responsive indicators: *collectivist cultural orientations, humanized educational environments, and holistic support*.

An example of emergent culturally responsive indicators is cultural collectivist Orientation, which refers to the idea of cultivating an environment that promotes teamwork and fosters mutual success (Museus, 2014b). Participants expressed that compared to their departments, Carver created a sense of mutual success in knowing where students were in their programs and providing the necessary support needed to navigate their programs. Another prominent example indicator was holistic support. Holistic support refers to the access that students have to faculty or staff that they are confident in receiving various levels of support. This indicator spoke volumes to the culture and climate of the program in establishing a connected support system for students to navigate when they encounter a need for support and resources throughout their graduate matriculation. Participants expressed their gratitude for the program director's ability to cultivate a safe space for students to navigate hard conversations and receive support and resources to better address those challenges. The data showed that the Carver program embraced and employed a more comprehensive approach to developing program initiatives to support Carver scholars. Students were now experiencing the program in a different light, where they met more frequently, from having seminars once a month to weekly

seminar meetings. They had increased opportunities for engaging and receiving assistance from their peers and trusted faculty while also receiving increased access to support services. This leads to the next theme, which discusses how students envisioned the future of the program for the program and future scholars.

### ***Theme 3: Envisioning Increased Program Value***

Theme three, generated for both student participant groups, demonstrated that the Carver program made programmatic contributions to fostering a safe space, culture, climate, and community for students to be expressive and obtain support through programmatic and institutional resources. However, no program is perfect, and for Carver, it was important for both past and current scholars to identify their future personal and professional needs and if the program met each of their expectations. There was an overlap in the responses from past scholars and current scholars. However, past scholars identified more programmatic initiatives, such as increasing seminar workshops and engagement. Considering how the program has evolved, data revealed that there was significant growth over time in the program and program initiatives. In addition, another key value for past and current scholars envisioning the value of Carver was to increase the interactions and engagement of faculty with the Carver program. Additionally, qualitative findings also revealed that to sustain a program like Carver, university buy-in and trust are vital in fostering not only the success of students but also the success and sustainability of future programming and scholars.

Research Question 3: Examine the Experiences of Faculty in Supporting the George Washington Carver Assistantship Program and Program Scholars

***Theme 1: Faculty Support Dynamics and Engagement with Program***

The faculty in this study revealed the relationship between the Carver program, faculty, and respective departments. This study revealed that the faculty's role in engaging with the Carver program is limited to supporting students through funding support and academic advising. Faculty had very little interaction with the program unless they were invited to participate in specific program initiatives. In other words, evidence presents that there is a lack of communication between the Carver program and faculty. The Carver program does not support students financially solely through the Carver program; a partnership has been established between the department and the Carver program. The Virginia Tech CALS creates a budget for Carver, and the departments work together to develop a budget. Both budgets from Carver and the respective departments are brought together in partnership to support program scholars. The Carver program does not solely support scholars from its own budget. Faculty shared that although funding is a large component of their communication with the program, a large part of supporting students is being communicated with to know what the program expects of the scholars.

***Theme 2: Factors That Impact Scholar Development***

In this theme, faculty identified factors that impacted their processes and approaches to cultivating their Carver advisees' development as scholars. The faculty participants did not find value in the programmatic components and expectations of the program for scholars. They expressed concern about scholars having an excessive workload and that the program seminars take away from the student's ability to succeed in their programs. Faculty perceptions of the

student's engagement with the program were that scholars should not be required to show up for Carver Program initiatives when it takes away from their research development in their respective academic programs. Trust and communication were also key factors that emerged from faculty that directly impacted their experiences in scholar development.

Gilmore et al. (2016) acknowledged that the most common key value to the graduate learning experience was having effective communicative interactions with advisors. This also correlates with how advisors identified career development as a key component of scholar development. Faculty identified the path to establishing career goals that impact their process in developing their scholars as well-rounded students. The goal of faculty advisors is to assist students in navigating their program toward degree attainment. Faculty acknowledged the factors that impact that process, but a large part of addressing these factors is increasing the trust and communication in the advisor/advisee relationship.

### ***Theme 3: Faculty Define Student Success***

Faculty advisor's experiences and perceptions of graduate student success are still under-investigated (Gilmore et al., 2016). In correlation with the literature and the student participant groups in this study, student success is defined not only by success factors directly related to academics but also consists of holistic values and approaches such as advisor/advisee relationships, establishing a community of support and connection, belonging, self-empowerment and efficacy, and access to resources (Bain et al., 2011; Premraj et al., 2021; York et al., 2015). The insights from each of the faculty provided a snapshot of the factors that they found most relevant to establishing student success. Findings from faculty participants indicated faculty defined student success based on students' ability to establish self-efficacy themselves, students' ability to reach degree attainment, fulfill their graduate duties, and secure a job upon

degree completion. The questions asked by the researcher were largely broad and pertained to variables both inside and outside of academics. In this case, faculty responses indicated a direct correlation and significant association with academics. Faculty presented no holistic factors or variables for consideration of what is common in defining student success outside of student's success in academics. This gap illustrates how students see themselves and define success versus how faculty see their students and define success.

### **Research Limitations and Recommendations**

The researcher was affiliated with the Carver program, creating unintentional bias because of their pre-existing knowledge of the program using insider status. Insider status as a researcher refers to having inside knowledge and access to a particular social group to which they belong to that group and share characteristics (Gair, 2012, as cited in Liu & Burnett, 2022). Although insider status allows for deeper awareness, trust, and knowledge, pre- and post-biases can form (Brannick & Coghlan, 2007). The researcher could develop questions that would better gauge the program for deeper exploration of various aspects of the program from a more unbiased lens. The researcher had knowledge of specific program initiatives and how the weekly seminars were run; the interviewees were not asked to describe a typical Carver seminar. That question could lead to participants discussing the ways they enter the space and what they intend to get out of those weekly meetings. While the researcher agrees that semi-structured interviews were the best approach in collecting data for this study, this study could have also employed focus groups with the student participant groups following the completion of the semi-structured interviews.

The AI model was specifically used in the process of developing questions that allowed participants to think positively about their experiences in the program (Bushe, 2012). A key

component in the AI model is the Destiny stage, which involves focusing on participants working collaboratively to develop and organize the shared goals and aspirations of the program. Carver cultivated a space for a collective community for students to feel part of the program in reaching student success; this study could benefit from employing a focus group to bring the students together to work in tandem to envision the future of the Carver Assistantship program. Employing that process would strengthen the data and allow students to be part of the process in establishing how their needs could be better met for themselves and future program scholars.

Lastly, the researcher utilized the CECE Model's nine constructs in the second round of coding to capture which of the nine indicators emerged; however, the researcher should have considered conducting open coding in the first round. The second round of coding was limited by only utilizing the nine measurable constructs. Considering the vastness of the CECE Model and its ability to acknowledge various factors that impact and lead to student success, the entire CECE Model should be employed in the second round of coding for the researcher to identify more in-depth the various components that impact students' overall success; from the external, pre-college experiences and individual influences (Museus, 2014b). It does not limit the study to the CECE Model nine indicators of a culturally engaging campus environment.

### **Program Limitations and Recommendations**

The Carver program cannot work to support scholars in its capacity. The Carver program should increase the communication loops to faculty who have Carver scholars. Active engagement at the institutional, college, department, and program levels to support the program and scholars is critical for program scholars and the sustainability of future programming. One of the largest gaps in the results was the disconnect and communication among the stakeholder groups involved in supporting Carver scholars. Students and faculty acknowledged a need for an

improved relationship and involvement with the Carver program, faculty, and the departments. Strengthening the faculty and departmental relationships with the Carver Program would provide faculty with more insight into how the program fosters holistic values that promote student success. From a functional programmatic lens, faculty would have more insight into the requirements and programmatic ask of the student, allowing them to support the student through their scholarly academic and fellowship duties.

Opportunities to advocate for the program and students to showcase the importance of the program to stakeholders involved would be to implement a monthly or semester success story showcase. This would encompass highlights of success stories of the students' positive impact on not only the students but the faculty and broader community, such as departments and overall college. Providing the space and opportunity to share highlight testimonials and outcomes that demonstrated how the Carver program initiatives positively impacted students' development and productivity in research can effectively include faculty in the program but also effectively inform them of the program beyond funding for supporting scholars and allow them to play a more active role in the program as support for their students.

This would then align the student's and faculty's values to support students not just in a linear capacity but in a well-rounded, holistic capacity. Student success is defined by the holistic aspects of building connections and community or enhancing social, emotional, and financial health. In addition, academic achievement, the gained knowledge, skills, competencies, and attainment of learning objectives encompass the overall educational experience. Neither of those characteristics of student success stands alone. They each work in tandem with the experiences of each individual student to define that student's success and academic matriculation.

Faculty shared that they perceived the program takes away from the scholar's academic experiences through the various mandatory program requests, and the program should focus on providing funding resources. The program should work to increase its internal and external institutional partnerships in efforts to create advocacy, support, and additional resources to expand the program, program value, and knowledge to its stakeholders. With the current political climate, programs like Carver have to consider its future existence outside of the DEI context. As politics continues to intersect with institutional programs, ensuring the sustainability of all institutional support programs is critical. Within the political context, it is critical when securing the future of the Carver program through the college that there is an intention for the program to align with government funding priorities. Staying informed of changes in government funding will allow Carver to align its program initiatives with different policy and political priorities.

In addition, the application to ensure program sustainability is cultivating stronger relationships with alums to engage and foster support for graduate programs through funding support, alumni-to-student mentor programs, and developing network opportunities. Alums can contribute additional funding support and advocacy for the sustainability of the program. The Carver program could also employ a review to measure and report program impact, including academic and research achievements, as well as societal contributions. This data could be valuable in articulating the importance of institutional support programs that support graduate students to policymakers, internal and external funders, and other stakeholder groups, ensuring continued support for program sustainability. This would inform stakeholders of increased program insight and potentially increase their perceptions of Carver's value as a program in addition to just being a funding resource. Additionally, Carver is not generalizable to other

program contexts of students and faculty because the experiences are specific to the student and faculty groups that were in this study. However, the data can be used as a guide to examine other program experiences and outcomes.

### **Recommendations for Future Research**

Future research could investigate the experiences between underrepresented and underserved student populations who are part of institutional support programs versus underrepresented and underserved students who are not enrolled in a Carver-like program. Having both perspectives of each group would provide valuable insight into the varied experiences among these student groups. It would also prompt institutions to look more into the environments created to support students in reaching degree attainment and career success.

Applying the CECE Model could also provide further insight into the intentionality at the institutional, college, and department levels alone to how they establish and foster culturally relevant and responsive environments for students to thrive at their highest potential. The second research recommendation would be to examine the program from an internal operational perspective to document and understand the policies, processes, and procedures in place to support the program and allocation of resources. Employ a systems thinking framework to examine the systems in place more intently and allow the Carver program to function and support scholars. Finally, future research should take an evaluative approach to examine the program from a culturally responsive lens. The Carver program receives enough funding to support up to 25 students over two to three years in a graduate program. There is no record of a program evaluation ever being completed on the Carver Program. An external evaluation would inform future programmatic changes and logistics on the program and internally be able to document how the program has evolved at Virginia Tech. If the university intends to continue

supporting the Carver program in efforts to support underrepresented and underserved students in reaching student success, a formal evaluation of Carver is necessary to identify what is currently being done and how the program can be advanced in its efforts to continue supporting future scholars and programming.

## **Conclusions**

The National Science Foundation (2023) reported that as a collective, Hispanic, Black, Alaska Native, and American Indian populations made up the U.S. population by 31% but only 24% of the STEM workforce back in 2021. These populations were perceived to be suited to work in roles that required technical skills and certificates rather than positions that required bachelor's or professional degrees. Given the value and importance of obtaining a postsecondary education and degree as a key component to enhancing social capital, mobility, economic freedom, and productivity, access to resources in obtaining a college degree at a graduate level in STEM (Rincon & George-Jackson, 2014), should remain a priority. Society has work to do to build a more sustainable system to support and retain underrepresented and underserved populations in the STEM workforce.

This study investigated the Virginia Tech GWC Assistantship program's impact on student success. This study sought to understand how institutional support programs and interventions foster culturally engaging campus environments targeted to underrepresented and underserved graduate students in STEM disciplines. The researcher incorporated triangulated data from past program scholars, current scholars, and faculty to gain knowledge on the experiences and provide evidence of the program's impact on student success. Students indicated community, identity, self-reassurance, empowerment, and access to resources were most important to the success of graduate students' success (see Appendix E). The faculty participants

identified variables such as degree attainment, fulfilling graduate duties, and securing a job as their main impacts on student success.

Of the nine CECE Model constructs, eight of the nine constructs emerged from the study. Students identified, from their experiences, the variables that impact student success. From those experiences, the CECE Model indicators were used as measurements to acknowledge the degree to which campus environments were relevant in practice and responsive in the systems that were employed, resulting in the variables identified that allowed students to thrive and succeed through their graduate programs (Museus et al., 2017).

The final findings focused on how the participant groups envisioned the program for future programming and scholars. Each participant group contributed valuable approaches to enhancing programming capacity, sustainability, and engagement. Although students found that there was minimal engagement between their academic departments, advisors, and the Carver program, creating a system of communicative partnership and support for all stakeholders involved is critical for scholars to thrive and be successful.

The Carver program was designed to increase the numbers of underrepresented and underserved populations in the CALS, increase recruitment and retention, and support students toward degree attainment, which is the goal and measure of the program (Grayson, 2021). The student perspectives offered insight into the evolution and growth of the program. The varied experiences and ways in which it has supported students throughout the years have helped cultivate safe spaces for students to not be led by the agendas of others but to take ownership of their graduate journey and experiences based on their participation in the program. Faculty perspectives offered insight from an external perspective to the program. Faculty in this study present as support factors to the program and program scholars and to continue working in

tandem to continue serving students in reaching academic and career success. Although this study was conducted as a case study design, it is hopeful that other Carver-like institutional programs find the insights of processes, approaches, and perspectives useful when examining the impact and sustainability of institutional support programs that serve underrepresented and underserved graduate students in STEM disciplines.

Student success was met and presented through the lens and perspective of the students through their expression of different stages and experiences. In contrast, student success was also met and achieved from the faculty perspective. As discussed, student success is not a one-sided function. To achieve student success, the experience is not linear and encompasses intuitive, tangible, and intangible efforts from each stakeholder involved in supporting the student and their graduate matriculation. This study offered deeper insight into these facets and provided an enhanced perspective on how we view student success through establishing culturally relevant and responsive environments that enhance students' academic and overall educational experiences.

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## **Appendix A: Past Program Scholars Interview Guide**

### **Demographics:**

- Name
- Program Name
- Current Job Title and Employer
- What year(s) were your graduate studies funded through the Carver program?
- Tell us about yourself and your interest in applying to Carver or accepting the funding offer.

### **Programmatic Impact:**

- How do you define student success
- When you were a scholar, did you feel like you belonged to the Carver community? Why or why not?
- During your time of enrollment in Carver, were there any particular skills gained that you feel contributed to your career?
- Can you describe your experiences interacting and connecting with other program scholars? And Faculty?
- What opportunity do you have to connect with students from different backgrounds in the program?
- What opportunity did you have to connect with your cultural community?
- From your perspective and experiences as a past scholar, what aspects of the program were particularly effective, and what areas could be improved to better support future participants?
- Based on your knowledge and experience with the Carver Assistantship program, imagine the perfect program that would promote your success. What would that program look like?

### **Career Journey:**

- Were there any aspects of Carver, whether funding or programmatic aspects, that impacted your career choice or journey? If so, where was the impact?

### **Follow-up Questions:**

- Is this your first time talking formerly about your experience in Carver?
- Think about your time as a new scholar coming to Virginia Tech. What are some key pointers you would tell yourself how to navigate as a graduate student at Virginia Tech as a scholar?

## **Appendix B: Current Carver Scholars Interview Guide**

### **Demographics:**

- Tell us about yourself and your interest in STEM.
- What year(s) were you funded through Carver?
- Please tell us about your interest in joining the Carver program.

### **Student Success:**

- How do you define student success?
- Do you feel like you belong to the Carver community? Tell us more about why or why not.
- Can you describe your experiences interacting and connecting with other program scholars? And Faculty?
- What opportunity do you have to connect with students from different backgrounds in the program?
- What opportunities do you have to positively impact your cultural community as a Carver scholar
- 
- Describe your support and network of relationships as a Carver scholar.
- How do you describe the support you receive from your faculty advisor and supervisor?

### **Programmatic:**

- Tell us more about your experience in the Carver program.
- How would you describe your experience in the Carver program?

### Discovery Phase-

- How have you used the program to assist in your matriculation in your program? ● In what ways have you benefited from participating in the program?
- Can you describe any significant valuable experiences that stand out to you from participating in the program?
- Imagine Carver exceeding all of your expectations. What does that look like, and what components contribute to the program's success?

- What could the program do to create an even more impactful and enriching experience for Carver scholars?
- Imagine a scenario where academic support services were a key component in your progression toward a successful career in STEM. What does that look like to you?

## Appendix C: Faculty Interview Guide

### Demographics:

- Tell me what department you are in and a little about yourself.
- How long have you worked with the Carver program?

### Engagement:

- How do you identify the importance of your role in ensuring the success of program scholars?
- What specific approaches do you find most effective in supporting and guiding Carver graduate students through their program experience? Provide examples where these approaches had a positive impact.
- What types of assistance and guidance do you/or have you provide to help students succeed academically and professionally?
- Have you encountered challenges while supporting Carver scholars? How did you address those challenges?
- What strategies do you utilize to overcome challenges and ensure that scholars continue to progress through their programs?

### Programmatic

- Can you describe your role with the Carver program and your engagement with graduate program scholars?
- Describe the relationship between your department and the Carver program.
  - How does effective communication between Carver and your department enhance Carver scholar's experiences?

### Discovery-

- How would you describe your experience working with the Carver program?
- What resources, financial, technological, or human support, do you find most valuable in providing positive impact and support to Carver scholars?
- How do students learn about getting involved and funded through the Carver program?

## **Appendix D: Sample Interview Questions Based on the CECE Model 9 Indicators:**

### **5 Cultural Relevance Indicators:**

#### **1. Cultural Familiarity**

- a. Describe your experiences interacting and connecting with current program scholars.

#### **2. Culturally Relevant Knowledge**

- a. What opportunities do you have to connect with students from various backgrounds?

#### **3. Cultural Community Service**

- a. What opportunities do you have to positively impact your cultural community as a Carver scholar?

#### **4. Meaningful Cross-Cultural Engagement**

- a. Describe opportunities to discuss critical issues with individuals from various Diverse backgrounds.

#### **5. Cultural Validation**

- a. How have you seen your culture valued throughout the Carver program?

### **4 Cultural Responsiveness Indicators:**

#### **1. Collectivist Cultural Orientations**

- a. Describe your experience of receiving support from the students and administration of the Carver program.

#### **2. Humanized Education Environments**

- a. How do you describe the support you receive from your faculty advisor and Supervisor?
- b. How do you describe the support you receive from the Carver Administration?

**3. Proactive Philosophies**

- a. How often do you receive information about program and campus support through Carver?

**4. Holistic Support**

- a. Describe your support and network of relationships as a Carver school

**Appendix E: A Priori of Research Questions, Propositions, Supporting Literature:**

Research Questions	Proposition	Supporting Literature	Interview Questions Past Program Participants	Interview Questions Current Program Participants	Interview Questions Faculty Participants
<p>RQ 1: How do institutional support programs foster a culturally engaging campus environment for Underrepresented and underserved graduate students in STEM disciplines have access to support?</p> <ul style="list-style-type: none"> <li>• What are the experiences of George Washington Carver Assistantship Program’s past graduate scholars as program participants? (Past Scholars)</li> </ul>	<p>The George Washington Carver Program enhances students' access to various forms of support through community-building and engagement, financial support, professional/workforce development, and academic support for underrepresented and underserved graduate students</p>	<p>(Ballen et al., 2017)            (Estrada et al., 2016)            (George et al., 2019)            (Ghazzawi et al., 2021)            (Goldsmith &amp; Presley, 1999)            (Kricorian et al., 2020)            (Museus, 2014a)            (Palid et al., 2023)            (Palmer et al., 2010)            (Premraj et al., 2021)            Nicole &amp; Deboer, 2020)</p>	<p>Programmatic Impact:</p> <ul style="list-style-type: none"> <li>• How do you define student success?</li> <li>• When you were a scholar, did you feel like you belonged to the Carver community? Why or why not?</li> <li>• During your time of enrollment in Carver, were there any particular skills gained that you feel contributed to your career?</li> <li>• Can you describe your experiences interacting and connecting with other program scholars? And Faculty?</li> <li>• What opportunity do you have to connect with students from different backgrounds in the program?</li> <li>• From your perspective and experiences as a past scholar, what aspects of the program were particularly effective, and what areas could be improved to better support future participants?</li> <li>• Based on your knowledge and experience with the Carver Assistantship program, imagine the perfect program that would promote your success. What would that program look like?</li> </ul> <p>Career Journey:</p> <ul style="list-style-type: none"> <li>• Could you describe your career matriculation since graduating from your graduate program? (That can include jobs, promotions, professional/skill development, and transitions.)</li> <li>• Were there any aspects of Carver, whether funding or programmatic aspects, that impacted your career choice or journey? If so, where was the impact?</li> </ul>		

Research Questions	Proposition	Supporting Literature	Interview Questions Past Program Participants	Interview Questions Current Program Participants	Interview Questions Faculty Participants
<p>RQ 2: How do institutional support programs foster a culturally engaging campus environment for Underrepresented and underserved graduate students in STEM disciplines access to support?</p> <ul style="list-style-type: none"> <li>• How does the George Washington Carver Assistantship Program impact the success of current scholars? (Current Scholars)</li> </ul>	<p>The Impact of the GWC program on graduate scholars enhances support toward graduate students' transition into graduate programs and matriculation toward degree progress, building community, academic support, and overall student success. Graduate scholars who encounter more culturally engaging campus environments experience more success in their graduate programs.</p>	<p>(Ashton &amp; Doncaster, 2021) (Bork &amp; Mondisa, 2020) (Freeman, 2005) (Kricorian et al., 2020) (Museus, 2011)</p>		<p>Programmatic:</p> <ul style="list-style-type: none"> <li>• How would you describe your experience in the Carver program?</li> <li>• Discovery Phase</li> <li>• How have you used the program to assist in your matriculation in your program?</li> <li>• In what ways have you benefited from participating in the program?</li> <li>• Can you describe any significant valuable experiences that stand out to you from participating in the program? Dream Phase</li> <li>• Imagine Carver exceeding all of your expectations. What does that look like, and what components contribute to the program's success?</li> </ul> <p>Student Success:</p> <ul style="list-style-type: none"> <li>• How do you define student success?</li> <li>• Do you feel like you belong to the Carver community?</li> <li>• Tell us more about why or why not.</li> <li>• Can you describe your experiences interacting and connecting with other program scholars?</li> </ul> <p>And Faculty?</p> <ul style="list-style-type: none"> <li>• What opportunity do you have to connect with students from different backgrounds in the program?</li> <li>• What opportunities do you have to impact your cultural community as a Carver scholar positively?</li> <li>• Describe your support and network of relationships as a Carver scholar.</li> <li>• How do you describe the support you receive from your faculty advisor and supervisor?</li> </ul>	

Research Questions	Proposition	Supporting Literature	Interview Questions Past Program Participants	Interview Questions Current Program Participants	Interview Questions Faculty Participants
<p>RQ 3: How do institutional support programs foster a culturally engaging campus environment for underrepresented and underserved graduate students in STEM disciplines access to support?</p> <ul style="list-style-type: none"> <li>• What are the experiences of faculty in supporting the George Washington Carver Assistantship graduate program scholars? (Faculty)</li> </ul>	<p>Graduate students often do not have the opportunity to interact and engage with peers like undergraduate students. The GWC Assistantship program provides graduate students the opportunity to interact and engage with faculty, strengthening their engagement in activities both inside and outside of their academics. The partnership between the GWC program and faculty is effective in supporting and contributing to the GWC program.</p>	<p>(Azevedo et al., 2017) (Chrzanowski &amp; Poudyal, 2019) (Harwood et al., 2012) (Johns Hopkins University, 2019) (Luft et al., 2004) (Maher &amp; Macallister, 2013) (Museus, 2010) (Museus, 2014b) (Muesus, 2017) (Museus &amp; Saelua, 2017) (Nettles, 2006) (Rigler et al., 2017) (Venkatesh, 2012)</p>			<p>Programmatic:</p> <ul style="list-style-type: none"> <li>• Can you describe your role with the Carver program and your engagement with graduate program scholars?</li> <li>• Describe the relationship between your department and the Carver program.</li> <li>• How does effective communication between Carver and your department enhance Carver scholar's experiences?</li> <li>• Discovery <ul style="list-style-type: none"> <li>o How would you describe your experience working with the Carver program?</li> <li>o What resources, financial, technological, or human support, do you find most valuable in providing positive impact and support to Carver scholars?</li> <li>o How do students learn about getting involved and funded through the Carver program?</li> </ul> </li> <li>• Dream <ul style="list-style-type: none"> <li>o From your perspective, what does the ideal partnership between your department and the Carver program look like, with the students being the focus?</li> </ul> </li> </ul> <p>Engagement: (Student)</p> <ul style="list-style-type: none"> <li>• How do you identify the importance of your role in ensuring the success of program scholars?</li> <li>• What specific approaches do you find most effective in supporting and guiding Carver graduate students through their program experience? Provide examples where these approaches had a positive impact.</li> <li>• What types of assistance and guidance do you/or have you provide to help students succeed academically and professionally?</li> <li>• Have you encountered challenges while supporting Carver scholars? How did you address those challenges?</li> <li>• What strategies do you utilize to overcome challenges and ensure that scholars continue to progress through their programs?</li> </ul>

## Appendix F: Participant Recruitment Letter

My name is Kellie Johnson, and I am a doctoral candidate in the Department of Agricultural Leadership and Community Education at Virginia Tech. I am pleased to invite you to participate in a research study entitled “*An Intrinsic Case Study of Virginia Tech’s George Washington Carver Assistantship Program: Fostering Student Success Through Culturally Engaging Campus Environments*”. We are talking with past Carver scholars, current Carver scholars, and faculty at Virginia Tech to explore the impact of support programs such as the Carver Assistantship program on underrepresented and unserved graduate students in STEM disciplines. We are conducting this research to gain relevant information that could inform how these programs influence students toward reaching academic and career success. Your participation will include an approximately 45-60-minute interview via Zoom. Your participation in the interview is completely voluntary. Please complete the when2meet to participate in this research study. Your information will remain completely confidential for this research project. This study has been approved and deemed exempt by the Virginia Tech IRB.

If you would like to request additional information about this study. Please feel free to send an email to [Kelliej@vt.edu](mailto:Kelliej@vt.edu) or the principal investigator Dr. Tiffany Drape [Tdrape@vt.edu](mailto:Tdrape@vt.edu).

Thank you again for considering being a part of this study! Please complete the meeting link in my signature if you are considering participating.

Sincerely,

Kellie

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***Need to schedule a meeting?***

<https://calendly.com/kellievj>