WOMEN OF COLOR IN STEM: NAVIGATING THE TRANSFER EXPERIENCE

by

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ABSTRACT

LAUREN E. SLANE. Women of Color in STEM: Navigating the Transfer Experience. (Under the direction of Dr. MARK D'AMICO)

As the entry point into higher education for over half of the bachelor's degree earners, (Trapani & Hale, 2019), community colleges are positioned to have a positive impact of bringing a more diverse student group into science, technology, engineering, and mathematics (STEM) majors. However, the vertical transfer function from community colleges into a four-year university is often not clear resulting in a gap between those with transfer aspirations and bachelor degree attainment. There are unique barriers that women of color transfer students encounter that can threaten persistence in STEM. This study contributed to the few studies (Allen et al., 2022, Jackson, 2013, & Reyes, 2011) that have focused on the experiences of women of color in STEM and transfer. The purpose of this qualitative phenomenological transfer student study was to understand how pre- and post-transfer women of color in STEM majors experience the transition into university from community college in North Carolina. This longitudinal study used interview data from 14 women who participated in a larger transfer study. Six of the women provided three interviews. Guided by the reconceptualized model of multiple dimensions of identity (Abes et al., 2007), the role of social identities and the impact on educational decisions was explored. Five major themes were identified: (1) the internalization of community college stigma, (2) blindsided: post-transfer rigor, (3) the loss of personal connection post-transfer, (4) feeling behind and other perceived roadblocks for STEM transfer students, and (5) can't do it alone: leaning on support networks for success. The findings from this study led to recommendations to the current articulation agreement structure in North Carolina, and recommendations for post-transfer institutions to better support women of color in STEM.

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DEDICATION

To Dave, Sam, and Emerson. You are my heart and my world. Dave, thank you for your patience, support, and motivating words of wisdom when I needed it. Sam and Emerson, your inquisitive natures inspired me throughout it all. I cannot wait to be there right by your sides during your own educational journeys. I love you!

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE: INTRODUCTION TO THE STUDY

There is a need in the United States to train more scientists, engineers, and technicians to fulfill the growing workforce demands and gain from the positive impact that diverse perspectives bring to science, technology, engineering and mathematics (STEM) occupations (Ferrini-Mundy, 2013; Malcom, 2010). At the same time, women and Black, Indigenous, and people of color (BIPOC) remain disproportionately underrepresented and historically excluded from many STEM fields (Rainey et al., 2018). Community colleges have the potential to train an increased number of students in STEM and bring in a more diverse student population. The transfer function from two-year into four-year institutions in STEM majors is acknowledged as important in the United States, but there is a lack of research on the topic (Wang, 2017). Community colleges are a postsecondary education option that are positioned to increase STEM education enrollment, that could ultimately have an impactful influence on diversifying STEM education, which in return will lead to a more diversified STEM workforce (Dinh & Zhang, 2020).

Community colleges are access institutions that have been a popular pathway into higher education. Over half (53%) of the bachelor's degree earners between 2010 and 2017 had some coursework completed at a community college, and 26% earned an associate degree prior to transfer (Trapani & Hale, 2019). Furthermore, community colleges are the entry into post-secondary education for a disproportionate number of BIPOC, low-income, and first-generation students (Schudde & Goldrick-Rab, 2015) making the need to understand their transfer experiences essential (Jackson et al., 2013).

The vertical transfer function from two-year colleges to a four-year institution offers a direction towards a baccalaureate degree, but the path is often not straightforward or clear and

can result in a low number of students who successfully complete a bachelor's degree. Although vertical transfer is a key goal of community college, the transfer function has proven to be imperfect resulting in inequity in educational success (Schudde & Goldrick-Rab, 2015). The National Student Clearinghouse Research Center 2017 *Tracking Transfer Signature Report* provided data on the metrics for community colleges that focused on first-time students who entered higher education by community college in fall 2010 (Shapiro et al., 2017). Out of the approximate 852,000 students who started in Fall 2010, 31.5% transferred into a four-year institution within six years (Shapiro et al., 2017). Moreover, only 13% of the bachelor's degree completers within six years were students who entered higher education via community college in fall 2010 (Shapiro et al., 2017).

Statement of the Problem

Vertical transfer insufficiencies can have negative outcomes for students (Taylor & Jain, 2017). There continues to be an increase in students entering community college with transfer intentions, making the need to assist in successful transfer even more vital (Hagedorn et al., 2006). Underrepresented student groups are often the students who are most dramatically impacted by weak transfer structures (Taylor & Jain, 2017). There have been efforts by both four-year universities and community colleges to address the inadequacies within transfer and attempts to streamline the transfer pathway to address students' needs both pre- and post-transfer.

Due to their benefits, that include affordable tuition, small class sizes, and flexible course schedules, community colleges are often the choice institution for adult learners, women, and historically underrepresented racial and ethnic groups (Hagedorn & Purnamasari, 2012; Reyes, 2011). Two-year institutions provide a large student population access to postsecondary

education, but empirical research has shown that students who start in a community college with intentions to obtain a baccalaureate degree have a lower probability of earning their baccalaureate than their counterpart students who start at a four-year institution (Bahr, 2013). The student success probability gets lower when students are in some STEM majors.

There are over 1,000 community colleges within the United States. Since the early 2000's there has been increased attention to the role community colleges can play in increasing gender and racial diversity in STEM education (Wang, 2013). Community colleges are being targeted as institutions that can contribute to addressing the issue of building the STEM workforce (Wang, 2013). In order to take advantage of the position community colleges are in to not only build the STEM pipeline, but also diversity the workforce, the inefficiencies in transfer processes for four-year degrees needs to be addressed at a greater level.

The Transfer Context in North Carolina

North Carolina has a governing board that oversees the public four-year institutions that comprise the University of North Carolina System (UNC System). Since 1997, North Carolina has had a Comprehensive Articulation Agreement (CAA) to ensure admission from a community college into one of the 16 public universities for transfer students with a minimum GPA of 2.0 (D'Amico & Chapman, 2018). Since 2014, North Carolina's CAA includes a 30-credit common core transfer and junior level status for community college transfer students who complete an associate degree (Hodara et al., 2017). It is up to the individual university programs to decide the program major-specific coursework transfer acceptance (Hodara et al., 2017); however, there are some "uniform articulation agreements" for certain majors that apply across certain similar programs at each institution (D'Amico & Chapman, 2018, p. 2).

In 2014, the CAA was revised with the intention to assist both students and advisors in their awareness of required coursework needed for the bachelor's degree and specific credits that can be taken at the time of community college (D'Amico & Chapman, 2018). The revised CAA included a requirement that each UNC System institution needs to create baccalaureate degree plans (BDPs) for all programs (D'Amico & Chapman, 2018). The BDPs are individual to each public four-year institution, and identify 60 transferable credits from the associate degree and indicate the additional required courses for a bachelor's degree.

Overview of North Carolina Transfer Students

Community colleges are the entry point into postsecondary education for a disproportionate number of low-income, older students, and students of color, (Ma & Baum, 2016) indicating that it is important to consider the role of community colleges in increasing the percentage of Black and Hispanic/Latinx bachelor degree attainment. North Carolina is an example of a state that suffers from large racial education disparity gaps. Only 19.4% of the Black subpopulation and 13.5% of the Hispanic/Latinx subpopulation in North Carolina are baccalaureate degree holders compared to 31.7% of the white subpopulation (D'Amico & Chapman, 2018). Community colleges are the gateway toward baccalaureate degree attainment for so many, making it crucial to understand student experiences and explore reasons for educational disparity and lower bachelor degree attainment for transfer students.

In North Carolina, 56,000 students (31%) in the UNC System in Fall 2016 entered as transfer students; most transferred from a North Carolina community college (D'Amico & Chapman, 2018). Although the transfer student population is large, the community college transfer indicators are behind in North Carolina compared to national indicators (D'Amico & Chapman, 2018). Students in the UNC System are less likely to earn a baccalaureate degree if

they transferred from a community college compared to their non-transfer counterparts (D'Amico & Chapman, 2018). Only 24% of North Carolinian transfer students successfully transfer within a six-year timeframe compared to the national average of 33% (D'Amico & Chapman, 2018). In North Carolina, 40% of students who do successfully transfer and earn a bachelor's degree within six years, lag behind the national average of 42% (Jenkins & Fink, 2016). Another concern is excess credits earned by transfer students. UNC system baccalaureate degree earners who transferred from a community college earn more credits, not needed for their degree, compared to that of non-transfer students within the UNC system (D'Amico & Chapman, 2018).

Credit Mobility

Nationwide, transfer policies are implemented at the state and institutional level to assist in ensuring credit mobility, but even with those policies in place nearly half of the students who transfer from a community college into a public four-year bachelor's serving institution experience some credit loss (Hodara et al., 2017). It is important to consider credit mobility and the connection to bachelor's degree attainment. There is a correlation between credits lost during transfer and lower bachelor's degree outcomes for community college students (Hodara et al., 2017).

To combat credit mobility issues and subsequent negative consequences from credit loss, many states decided to extend transfer policies between all public four-year institutions in the state as a mechanism to improve credit mobility (Goldhaber et al., 2008). The state and system transfer policies often include the transfer of general education credits and ensure associate degree holding students entrance into the public four-year institution as a junior (Hodara et al.,

2017). North Carolina is an example of a state that has a transferable common core and transfer associate degree polices (Hodara et al., 2017).

Hodara et al. (2017) explored credit mobility and statewide policies related to transfer into a four-year public institution from community college. Hodara et al. (2017) analyzed state and system policies and developed three categories: 2+2, credit equivalency, and institution-driven. North Carolina is an example of an institution-driven system. In institution-driven systems, articulation agreements state the lower division courses that transfer students need to take to transfer from a community college into a specific four-year institution (Hodara et al., 2017).

The act of state systems implementing credit mobility policies does not necessarily equate to improved bachelor's degree completion for transfer students (Baker, 2016). North Carolina has statewide articulation agreements, but that still leaves students in the position to know their major and planned baccalaureate degree earning institution early in their community college experience in order to ensure a smooth transition into a four-year university from community college (D'Amico & Chapman, 2018). A North Carolina community college advisor estimated that there are over 1,200 articulation agreements that advisors need to be aware of (Hodara et al., 2017).

Unique Barriers within STEM Higher Education

STEM encompasses a range of academic subject areas, some of which bring in a more balanced representation of the population, compared to other subject areas where diversity is poorly represented. Women have historically had a high participation in psychology, biology, and social science degrees (Trapani & Hale, 2019). Since 2000, there has been an increase in women participation in STEM degrees in computer science, mathematics, and statistics, but at

the same time the number of men continued to grow at a quicker rate than women (Trapani & Hale, 2019). Between 2000-2017, social sciences and psychology were the most popular majors out of science and engineering majors among underrepresented racial and ethnic student populations (Trapani & Hale, 2019).

Out of all the students who earned a bachelor's degree in a STEM major between 2010 and 2017, 47% had some coursework experience at a community college, and 18% transferred into a bachelor's degree program after completing an associate degree (Trapani & Hale, 2019). Even so, there is still a negative correlation between starting postsecondary education in a STEM major at a community college with successfully transferring and graduating with a bachelor's degree. Community college students in STEM are less likely to earn a baccalaureate degree compared to students who start at a four-year institution (Wang, 2015). Women and historically underrepresented student groups disproportionately are in the lowest skill set courses that results in higher overall attrition rates in STEM education compared to men and historically advantaged racial and ethnic groups (Bahr et al., 2016). The complexity and interdependency of STEM curriculum can create confusion (Bahr et al, 2016).

The past decade has seen some increase in the research on community college and STEM education, but there is room for that research to be expanded upon. Wang (2017) created the first STEM transfer model to map out the transfer process from the onset of entering STEM at community college, through bachelor, and career attainment in STEM. Wang's (2017) STEM transfer model is the first theoretical framework that highlights the outcomes specific to STEM and includes factors around learning and motivation specific to a STEM context. Dinh and Zhang (2020) studied community college transfer students' STEM degree completion success. Study findings indicated that student demographic characteristics are factors related to bachelor's

degree attainment success (Dinh & Zhang, 2020). Studies conducted by Zhang (2019) and Dinh and Zhang (2020) found that women transfer students have a greater likelihood to obtain a STEM bachelor's degree compared to men. Furthermore, Dinh and Zhang (2020) felt that their study findings supported the importance community colleges have on the success for women in STEM education. Studies specific to women of color are limited.

Women of Color in STEM

There have been targeted efforts made to draw in a more diverse population into STEM education that has resulted in increased student engagement from traditionally underrepresented groups; however, matriculating and retaining Black students in STEM has remained an issue (Morton & Parsons, 2018) that needs more attention. The culture in STEM education has historically both privileged and aligned with the norms of white men (Ong et al., 2017). Stereotyping an individual or entire group can cause grave danger and negativity for those being stereotyped against. In STEM, stereotypes have led to lower retention rates for Black students (Guiffrida & Douthit, 2010).

Women of color encounter unique sets of barriers as post-transfer students, that include transfer shock, a lack of social capital, age discrimination, and issues with expectations that external factors place on them (Reyes, 2011). Limited studies (Allen et al., 2022, Jackson, 2013, & Reyes, 2011) have focused on specific experiences of Black women in STEM and community college transfer. Qualitative researchers have explored the experiences of women of color and reported findings of feelings of isolation, a sense of not belonging, discrimination, and low self-confidence (Reyes, 2011). The barriers that women of color often encounter have the potential to threaten their persistence in STEM education (Ong et al., 2017).

Purpose

The purpose of this study is to understand the transfer experiences of women of color in STEM majors from community college into a four-year degree program. This study also explored how social identities are connected to experiences in higher education and transfer processes for women of color in STEM majors. The reconceptualized model of multiple dimensions of identity (RMMDI) guided this study. RMMDI provided a framework to explore the connections between contextual influences, self-perceptions, and how students make meaning of their dynamic identities (Abes et al., 2007). This study explored the role of multiple identities such as gender, race, and other social identities, and the relation between identities, the context, and the impact on vertical transfer experiences.

Research Questions

The following questions guide this research study:

RQ1: How do pre- and post-transfer women of color in STEM majors experience the transition into a university from community college?

RQ2: How do social identities inform STEM-related experiences for women of color in STEM majors?

Theoretical Framework: Reconceptualized Model of Multiple Dimensions of Identity

RMMDI was used as the theoretical framework to ground this study. Abes et al. (2007) took the model of multiple dimensions of identity (Jones & McEwen, 2000) and reconceptualized the model to include a meaning-making filter as a way to better understand the relationship between context and identity salience between social identities and the core identity. The reconceptualized model portrays identity construction in a two-dimensional form. The model includes ones' self-perceptions of multiple identity dimensions (Abes et al., 2007).

Different identity dimensions can include race, gender, social class, and sexual orientation. The second dimension is contextual influences, such as family, social norms, and peers. Placed between these two dimensions is a meaning-making filter. The way contextual influences go through the filter depends on how complex one's meaning-making capability is. Context will always play an influential role in identity perceptions, but the permeability of how much context informs identity development can be influenced by the individual's meaning-making capacity (Abes et al., 2007). In the context of transfer, researchers have collected data that indicate students' identity has a role in their transfer success (Taylor & Jain, 2017); however, the numbers of studies on the intersection of race/ethnicity and gender specific to STEM students is limited (Carlone & Johnson, 2007; Ong et al., 2011; Rodriguez et al., 2016).

Through their study participants, Abes et al. (2007) found that there is often a disconnection between multiple identities. This can be the byproduct of contextual influences, when one is taught to perceive their identities in a certain manner (Abes et al., 2007). Outside contextual influences can have an impact on how one perceives and constructs their perceptions of identities (Abes et al., 2007). RMMDI does not consider identities in isolation, but rather sees the interconnectedness of multiple identities and contextual factors.

Intersectionality and RMMDI are closely connected frameworks that place emphasis on relationship between identities while also considering the social systems and contextual influences. Crenshaw (1989) brought the framework of intersectionality into the mainstream. Crenshaw (1989) felt that there was a need for a framework that acknowledged the uniqueness of Black women, through the intersection of oppressed racial and gender identities. Crenshaw took into consideration the negative impacts institutional structures can have on women of color through the act of isolating multiple marginalized identities (Harris & Patton, 2018). Coming

from critical legal studies, Crenshaw saw this practice of making gender and race "mutually exclusive" within the legal system as damaging (Harris & Patton, 2018, p. 347). Alexander-Floyd (2012) defined intersectionality as "the commitment to centering research and analysis on the lived experiences of women of color for the purpose of making visible and addressing their marginalization" (p. 9) while questioning the status quo in mainstream institutional structures.

Through exploring the role of intersectionality as it relates to race/ethnicity and gender, researchers will be better able to understand challenges and barriers that women of color experience as transfer students (Rodriguez et al., 2016). As women in disciplines dominated by men, paired with underrepresented racial and ethnic identities, women of color in STEM may experience intersectional challenges (Jackson et al., 2013). Morton and Parsons (2018) took an intersectional approach to critically examine how the influence of social structures, such as politics and culture, impact STEM identity development, which deviates from "deficit orientations" (p. 1367) that have been commonplace in research on Black students.

Notable researchers (Carlone & Johnson, 2007; Ong et al., 2011; Rodriguez et al., 2016) have taken an intersectional approach to explore the experiences of women of color in STEM. In this study, I attempted to incorporate an intersectional perspective through the RMMDI to explore how women of color transfer students in STEM make-meaning of their multiple identities and understand how social identities inform STEM related experiences. Exploring identity development in conjunction with intersectionality can be used in postsecondary education to contribute to the analysis of where power, privilege, and oppression are within higher education systems (Harris & Patton, 2018) and the vertical transfer function. The data that emerged, centered the individuals and their experiences with multiple identities, more so than a

Crenshaw's intersectionality lens that centers systems of power and the relationship between marginalized identities.

Through the exploration of social identities, researchers can explore how identities inform transfer experiences. Researchers have found that even with transfer aspirations being fairly equal among racial groups, white students are transferring at a higher rate than students of color (Wood et al., 2011). Institutional data from higher education institutions has shed light on how the vertical transfer function has a racial transfer gap (Crisp & Nunez, 2014). There needs to be continuous research that can inform policies and procedures, not only on why there is a racial transfer gap, but also how this gap can be reduced.

Overview of Methodology

A qualitative phenomenological research design was used to explore the lived experiences of the study participants. A phenomenological approach seeks to understand the essence within participants' lived experiences of a specific phenomenon (Merriam & Tisdell, 2014). In this study, I explored the phenomenon of transfer from a two-year college into a four-year institution. Phenomenology is an approach that gives the researcher an opportunity to explore a large idea (Tomaszewski et al., 2020) such as exploring the essence of transfer experiences.

The primary source of data collection was semi-structured interviews that captured the lived experiences of the study participants. The semi-structured interview format allows the researcher to keep conversation focused, while at the same time leaving space for "knowledge-producing potential of dialogue" (Brinkmann, 2018, p. 26). Interview data were collected from 14 participants. Each participant identifies as a woman of color, is in a STEM major, and is either pre- or post-transfer. Out of the 14, six women participated in three interviews. In

alignment with notable researchers, (Ong et al., 2011; Reyes, 2011) this study included women of color who identify as Black or African American, Hispanic or Latina, Native American or Alaska Native, or Asian or Pacific Islander.

Participants for the study were recruited from a diverse group of North Carolina public and private universities as part of a larger transfer research project funded by the John M. Belk Endowment. Emails were sent to North Carolina community college and university personnel asking for assistance in sending a participant recruitment email to students. The larger transfer research study interviewed 103 pre- and post-transfer students. My study explored the experiences of a specific subset of participants from the larger transfer study that included women of color who were pre- and post-transfer in STEM majors. There were 14 participants who met my study's eligibility requirements.

A phenomenological data analysis approach can be inductive, starting with reading the entirety of interview transcripts (Tomaszewski et al., 2020). An inductive approach is used as a way to understand and describe the lived experiences of the study participants (Tomaszewski et al., 2020). In this study, each transcript was read and reread several times as a way to pull text and highlight experiences the participants had being a pre- and post-transfer STEM majors. The final step resulted in the development of five central themes which led to the essence of the phenomenon (Tomaszewski et al., 2020).

Significance of Study

There is an acknowledgment that in order to increase future STEM workforce demand, more people need to be included and represented in STEM education. In the not so distant past, STEM fields were known as being exclusive and not welcoming to individuals who were outside of the traditional white man demographic. Research on women in STEM, and underrepresented

student groups in STEM, has been studied, but there remains a lack of racial and gender experiences that are specific to women of color being researched (Ong et al., 2011). This research study sought to build upon and add to the research findings on the exploration of experiences of women of color in STEM (Ong et al., 2011) and transfer experiences. Research that intentionally seeks to understand the participation, attrition, and retention specific to women of color is limited (Ong et al., 2011).

Delimitations

This study was within a boundary of a larger transfer student research study that explored experiences specific to transfer students in North Carolina. The larger study participant sample recruited pre- and post-transfer students from North Carolina community colleges and public and private four-year institutions. The sample size for this study was determined by who in the larger study met the eligibility requirements for this study and was willing to participant in an additional interview about STEM experiences.

Phenomenological reduction is the practice of not entering data collection with pre-understandings of the phenomenon (Vagle, 2018). In this sense, the phenomenological approach discourages researchers to enter the research with assumptions. Bracketing is a common practice within phenomenology as a way to set aside previous knowledge of a phenomenon as a way to exercise phenomenological reduction (Vagle, 2018). Phenomenological reduction does not, however, mean that a literature review is not conducted (Vagle, 2018). In this study, the review of literature did lead to the assumption that there are specific barriers that women of color in STEM encounter. This assumption drove the researcher to further explore the identities that the participants self-identified as salient.

There is an inconsistency in the definition of STEM, that Manly et al. (2018) found during their study where they performed a content analysis of 51 STEM related studies in the ERIC database that focused on gender and higher education between 2010-2018. Manly et al. (2018) concluded that there was a difference in STEM degree competition depending on the type of STEM program. For this study, the sample size was the result of eligible participants from a larger longitudinal qualitative transfer study, which impacted the researcher's decision to include a broad range of STEM majors. The National Science Foundation (NSF) uses a definition of STEM to include social and behavioral sciences (Manly et al., 2018). In addition, the Census Bureau defines STEM occupations as including computer, engineering, life science, physical science, and social science (NSF, 2015). Based on the nature of NSF's STEM definition and the Census Bureau's definition of STEM occupations, this study included participants in a behavioral science, psychology, major.

Definition of Key Terms

Women of color in this study is defined as women who are African Americans, Asian /Pacific Islanders, Hispanic/Latinx, and Native Americans groups (Ong et al., 2011). The use of Hispanic and Latinx were guided by the self-identified racial and ethnic demographic information participants provided on their demographic form, and how they self-described race and ethnicity during interviews.

Underrepresented students/groups was the chosen terminology for this study to describe what National Science Foundation (2019) terms "underrepresented minority groups" in science and engineering. Women, person with disability, Black or African American, Hispanic or Latinx and American Indian or Alaska Native, are underrepresented in science and engineering (National Science Foundation, 2019).

Science, technology, engineering, and mathematics (STEM) are a collective group of disciplines that are commonly referred to as STEM. STEM encompasses a wide range of academic disciplines. Physical sciences, engineering, mathematics, and computer science (PEMC) often lack a diverse representation of underrepresented student groups, whereas other-STEM majors have a perceived "social fit" resulting in higher persistence among underrepresented groups (Dika & D'Amico, 2016, p. 368). For this study, the term STEM will be all encompassing, including PEMC and other-STEM majors. Due to the limited number of women of color in STEM, this study needed to include all STEM majors to reach the sample size. In addition, this decision was made in part by modeling NSF's broad definition of STEM (Manly et al., 2018).

Summary

The need for a larger pool of individuals to fulfill the needs of the STEM workforce is evident. Over the past couple of decades, there has been an acknowledgment that broader participation in STEM not only can help with filling the workforce demands, but also shift to promoting STEM to be more inclusive has proven to be very beneficial. Community colleges are in a position to attract a diverse group of students and introduce them to STEM subjects and career pathways. The issue that arises is that although community colleges are an accessible and affordable entry point into higher education for so many, the bachelor's degree success rate is reduced for students who start at a two-year institution. That can become even more of an issue for STEM majors. Women of color in STEM face a unique set of barriers, including racism and sexism, that contribute to challenges of successfully transferring into a STEM bachelor's degree program. This study sought to contribute to the limited research on transfer experiences for women of color in STEM. Furthermore, the identities of women of color and how those

identities inform both their experiences in higher education and within the transfer process were explored.

Chapter two will provide a thorough review of literature on community college and vertical transfer, STEM education and community college, women of color in STEM majors, and intersectionality and higher education. The literature review provides support to rationalize the need for this study. Chapter three will go into further detail on phenomenology as a method and provide the steps of the study design and data analysis processes.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this study is to understand the transfer experiences of women of color in STEM majors from community college into four-year baccalaureate degree programs. In the United States, there has been a narrative that there is a shortage of people in STEM education and the STEM workforce (Wang, 2020). There is a national acknowledgment of the importance in broadening transfer in STEM majors from community college to four-year institutions as a way to address shortage concerns, but there is still very little research on this (Wang, 2017). When considering all of the students in attendance at the community college level in STEM with transfer aspirations, only 12% transferred within a six-year time frame (Wang, 2013).

Community colleges have a historical role as being access institutions that have diversified higher education. This study sought to expand upon existing literature and understand the experiences of women of color in STEM, including both the barriers they face, and mechanisms in place to assist in overcoming challenges. The RMMDI was used as a framework to understand the intersection and meaning making of social identities of women of color.

The review of literature covers several key topics associated with transfer function, women of color students in STEM majors, and intersectionality. The literature review addresses major themes that include (a) an introduction to community college and the vertical transfer function, (b) STEM education and community college, (c) women of color in STEM majors, and (d) intersectionality and higher education (see Table 1).

Table 1

Women of Color in STEM: Navigating the Transfer Experience: Identified Themes

Introduction to Community College and Vertical Transfer	STEM Education and Community College	Women of Color in STEM Majors	Intersectionality and Higher Education
• The role of community colleges (American Association of Community College, 2017; Bowen et al., 2009; Cohen et al., 2014; Hagedorn & Purnamasari, 2012; Jenkins & Fink, 2015; Kahlenberg et al., 2018; Reyes, 2011; Shapiro et al., 2013; Shapiro et al., 2017; Wang, 2020; Wang et al., 2021) • Community college transfer: Articulation agreements and guided pathways (Bailey, 2018; Bailey et al., 2015; Fink & Jenkins, 2017; Ignash & Townsend, 2000; Jackson et al., 2013; Jenkins et al., 2018; Kisker, 2007; Laanan et al., 2010; Taylor & Jain, 2017; Wyner et al., 2016) • Vertical transfer (Aragon & Perez, 2006; Bahr et al., 2013; Cohen et al., 2014; Crisp & Nuñez, 2014; Hagedorn et al. 2006; Jain et al., 2011; Jenkins & Fink, 2015; Kahlenberg et al., 2018; Martinez-Wenzl & Marquez, 2012; Monaghan & Attewell, 2015; Schudde & Goldrick-Rab, 2015; Shapiro et al., 2018;	• National need to broaden STEM education participation (Blackburn, 2017; Cohen et al., 2014; Ferrini-Mundy, 2013; Rodriguez et al., 2016; Wang, 2015; Wang, 2017; Wang, 2020) • Pathway to STEM baccalaureate (Jackson et al., 2013; Melguizo et al., 2011; Wang, 2013; Wang, 2015; Wang 2017; Wang, 2020) • Upward transfer in STEM majors (Bailey et al., 2015, Chan & Wang, 2020; Hatch & Garcia, 2017; Lopez & Jones, 2017; Packard et al., 2011, Taylor & Jain, 2017; Wang, 2017; Wang et al., 2021)	• Barriers that women of color encounter in STEM (Allen et al., 2022; Blackburn, 2017; Bottia et al., 2015; Carlone & Johnson, 2007, Chang, 2006; Hu & Ortagus, 2019; Jackson & Laanan, 2015; Johnson et al., 2011; Reyes, 2011; Rodriguez et al., 2016; Wang, 2020; Wang & Degol, 2017) • Power of mentorship and counterspaces (Carlone & Johnson, 2007; Dawson et al., 2015; Jackson, 2013; Jackson & Laanan, 2015; Johnson, 2012; Ong et al., 2017; Rockinson-Szapkiw et al., 2021; Rodriguez et al., 2016; Solorzano et al., 2000; Valenzuela, 2006) • Women of color post-transfer students in STEM (Carlone & Johnson, 2007; Chang, 2006; Jackson et al., 2013; Ong et al., 2011; Reyes, 2011; Rodriguez et al.,	• The History of Intersectionality (Alexander-Floyd 2012; Carbado, 2013; Crenshaw, 1989; Dill & Zambrana, 2009; Harris & Patton, 2018; Nash, 2008) • Intersectionality as a Framework in Higher Education Research (Collins & Bilge, 2020; Crenshaw, 1989; Harris & Patton, 2018) • Identity and women of color in STEM (Abes et al., 2007; Blackburn, 2017; Carlone & Johnson, 2007; Johnson et al., 2011; Malcom et al., 1976; Ong et al., 2011; Reyes, 2011; Valenzuela, 2006)

Introduction to Community College and Vertical Transfer	STEM Education and Community College	Women of Color in STEM Majors	Intersectionality and Higher Education
Taylor & Jain, 2017; Townsend, 2001) • Associate in Applied Science (D'Amico et al., 2021; Kujawa, 2013; State Board of Community Colleges & Board of Governors of the University of North Carolina, 2015) • Transfer Experiences (Allen et al., 2022; Bahr et al., 2013; Ceida, 2006; Chang, 2006; Crisp & Nuñez, 2014; Elliott & Lakin, 2020; Fink & Jenkins, 2017; "Graduation Rates for Transfer-In Students Starting in 2010-11," 2020; Herrera & Jain, 2013; Hills, 1965; Jackson et al., 2013; Jackson & Laanan, 2015; Jain et al., 2011; Jain et al., 2016; Laanan et al., 2010; Reyes, 2011; Taylor & Jain, 2017; Wang et al., 2021)		2016; Taylor & Jain, 2017; Wang, 2020)	

Introduction to Community College and Vertical Transfer

The Role of Community Colleges

The history of community colleges in the United States starts in the early twentieth century, during a time when the nation was expanding on all higher education (Cohen et al., 2014). In addition to the need for training a larger workforce, there was an idea that if more people in the United States had access to higher education then it would contribute to social equality and upward mobility (Cohen et al., 2014). Known at the time as "junior colleges," two-year colleges often emerged from the organization of universities who could benefit from them as feeder institutions (Cohen et al., 2014). The rise of community colleges, particularly outside of urban settings where many universities were located, opened doors and provided access to higher education to a broader population (Cohen et al., 2014).

Today, community colleges still serve as access institutions. Two-year institutions are the starting point into higher education for over 40% undergraduate students in the United States (American Association of Community Colleges, 2017; Jenkins & Fink, 2015). The emergence of community colleges provided the needed capacity to accommodate students entering into higher education (Jenkins & Fink, 2015). The percentage of students graduating from high school was more than double between 1924 and 1960 (Cohen et al., 2014). Both in the past and in the present, community colleges give many high school graduates the option to pursue higher education and offer additional benefits. The low cost of community college allows access to a broader student base; furthermore, they provide a higher education option to students who may not meet the admissions requirements of some four-year institutions (Jenkins & Fink, 2015). Due to their affordable tuition, small class sizes, and flexible course schedules, community colleges are often the choice institution for adult learners, women, and historically underrepresented racial

and ethnic groups (Hagedorn & Purnamasari, 2012; Reyes, 2011). As educational institutions that serve all students regardless of their academic background or preparedness, community colleges are essential in efforts to lessen economic inequality (Kahlenberg et al., 2018). The American Association of Community Colleges (2017) reported that in Fall 2015, over half of all Native American and Hispanic students, and over 40% of Black students in post-secondary education were enrolled in community colleges.

Cohen et al. (2014) defined community colleges as "any institution regionally accredited to award the Associate in Arts or the Associate in Science as its highest degree" (p. 5). Community college students who aspire to obtain a baccalaureate degree must go through the transfer process. The vertical transfer from a two-year institution to a four-year institution offers a pathway of upward mobility for students who have been historically underserved (Bowen et al., 2009; Wang, 2020). When considering all students who first enrolled at a community college in 2010, only 13% completed a bachelor's degree within six years (Shapiro et al., 2017). Evidence supports that earning an associate degree increases the likelihood of successfully transferring into a bachelor's degree program. The National Student Clearing House Research Center found that community college transfer students are more likely to complete a bachelor's degree if they transfer with a completed associate degree (Shapiro et al., 2013). This could be in part because associate degree holders have a better success rate at having a majority of their credits transferred (Jenkins & Fink, 2015).

The design of community colleges is certainly not solely to transfer students to four-year institutions (Cohen et al., 2014). Community colleges offer technical and continuing education opportunities as well (Cohen et al., 2014). There is, however, a high percentage of students entering community college with baccalaureate degree intentions. Using data analysis from the

Beginning Postsecondary Students Longitudinal Study conducted by the National Center for Education Statistics, researchers approximated that 70%-80% of all students who start at a community college have intentions to earn a bachelor's degree, but only approximately 20% complete a bachelor's degree within six years of initial enrollment (Wang et al., 2021). C. Lockwood Reynolds, an economist at Kent State University, estimated that beginning at a community college reduces a student's chance of receiving a bachelor's degree by 30% (Kahlenberg et al., 2018). There are incentives to start post-secondary higher education at a community college, but research does indicate that it can impact baccalaureate degree attainment. Jenkins and Fink (2015) believe that there are significant benefits to rethinking how to address some barriers in the vertical transfer process to improve success rates.

Community College Transfer: Articulation Agreements and Guided Pathways

Community colleges offer a pathway to obtaining a baccalaureate degree, but that pathway is often not direct or clear, creating a disparity among the percentage of students with baccalaureate degree aspirations and the actual percentage that reach their goal. Transfer function is the means to reach a four-year institution to ultimately complete the degree, but often times the transfer structure has insufficiencies and results in negative outcomes for students (Taylor & Jain, 2017). Historically marginalized student groups including students of color, low-income, and first-generation are often the students who are most drastically impacted by weak transfer structures (Taylor & Jain, 2017). This observation has not gone unnoticed and structural steps have been taken by both four-year universities and community colleges to address the issues and attempt to streamline the transfer pathway. Transfer partnerships between community colleges and four-year institutions are vital for students' transfer and their success in obtaining a bachelor's degree (Fink & Jenkins, 2017).

Articulation Agreements

Articulation agreements create policy between institutions to facilitate transfer (Taylor & Jain, 2017). They are important in the development of partnership between community colleges and universities (Kisker, 2007). Ignash and Townsend (2000) evaluated articulation agreements in 34 states towards the end of the twentieth century to measure the effectiveness of (a) transfer directions, (b) sectors, (c) transfer components, and (d) faculty involvement. Seven guiding principles to measure the strength of articulation agreements were identified:

1. Parity between community colleges and four-year institutions to ensure they are equal.
2. Parity between students who started at a four-year institution and transfer students.
3. Faculty to play a significant role in creating the articulation agreements.
4. Accommodation to students who transfer with an associate degree.
5. The development of agreements in specific program majors.
6. The inclusion of private colleges and universities in statewide articulation agreements.
7. The need for data to evaluate the effectiveness of the articulation agreement. (Ignash & Townsend, 2000)

Ignash and Townsend (2000) stated that faculty involvement in articulation agreements factored in to the success of partnership agreements. The involvement of faculty in articulation agreements promote strong partnership and have the impact to make the transfer process more effective (Kisker, 2007). There is an assumption that when articulation agreements and policies are finalized between institutions that it will help to provide access to four-year institutions to underserved student groups (Laanan et al., 2010). Unfortunately, faculty are often not brought into discussions about articulation agreements and the process remains very administrative (Taylor & Jain, 2017). The involvement of faculty and department leadership from four-year

institutions are important because they are the most informed about the program requirements and prerequisite course work, information that is necessary for transfer students to know while they are selecting their course work while still in community college (Fink & Jenkins, 2017). The involvement of program major faculty from two-year and four-year institutions in articulation agreements is essential in deciding what credits can transfer towards the major, preventing credit loss (Ignash & Townsend, 2000). Bringing in various constituents from community colleges and four-year institutions contributes to making effective transfer partnerships that will set transfer students up for success (Jackson et al., 2013). Wyner et al. (2016) found that relationship building between faculty and staff at partnering institutions builds a foundation for curriculum alignment and collaboration that supports successful student outcomes.

Guided Pathway Reforms

There is an equity gap in higher education (Bailey, 2018). Unrepresented student groups, that include Black, Hispanic, first-generation, and low-income are largely represented at community colleges (Bailey, 2018), where their chances to graduate with a bachelor's are lower than that if they started at a four-year institution. Bailey (2018) argued that low graduation rates can be, in part, the result of structural barriers. Guided pathway reforms are intended to dismantle the barriers and guide students through challenges such as understanding program requirements and access to appropriate advising (Bailey, 2018).

In their work to establish the guided pathways movement, Bailey et al. (2015) argued that there was a need for community colleges to undergo a complete programmatic and student support remodel to create a clearer pathway to completing a credential or continuing education. Bailey et al. (2015) found that community colleges offered hundreds of programs as a way to

serve everyone as access institutions; however, students were not receiving enough guidance to navigate the programs and pathways to credential or degree competition (Bailey et al., 2015). Bailey et al. (2015) coined that type of system as a "cafeteria college." They said that in the cafeteria-style institutions, students were taking courses outside of their program of study and were not aware of advising and support resources available to help them get through their programs without wasting time or money. The structural student success barriers that led to guided pathways reforms included a lack of advising and career coaching coupled with difficulties navigating courses and program guidelines. A large number of students entering community colleges come from educationally and economically disadvantaged backgrounds. That can lead to a lack of preparedness to navigate community college, which ultimately worsens the equity gap (Jenkins et al., 2018).

The guided pathways reform model uses program maps to detail the course sequence, progress milestones, and program learning outcomes (Jenkins et al., 2018). These maps keep students on track with an academic plan. The use of academic plans not only helps the students know what classes to take and in what semester, but it also helps the institution with scheduling courses. In the guided pathways model, students from the onset receive academic and career coaching to help identify what program is the best fit to achieve career objectives.

The guided pathways approach has become a national reform movement. The remodeling and interventions put into place under the guided pathways model address the need to improve student success for all students entering into the community college system and addresses issues around closing the achievement gap (Jenkins et al., 2018). Jenkins et al. (2018) noted that, as of spring 2018, more than 205 community colleges have committed to undertaking guided pathways reforms as part of a national, state, or regional effort. Additionally, many community

colleges implemented their own guided pathways reforms. Community colleges receive support from the American Association of Community Colleges (AACC) who assist colleges with implementing their reforms (Jenkins et al., 2018).

Vertical Transfer

Community colleges are the entry into post-secondary education for a disproportionate number of Black, Latinx, low-income, and first-generation students (Schudde & Goldrick-Rab, 2015). Although vertical transfer is a key goal of community college, the transfer function has proven to be imperfect, resulting in inequity in educational success (Schudde & Goldrick-Rab, 2015). Increasingly, there are more students entering community college with transfer intentions, making the need to assist in successful transfer even more essential (Hagedorn et al., 2006).

There are several different types of transfer patterns that students take. Vertical transfer pathway refers to one type of transfer pathway that is defined as transferring from a two-year institution to a four-year institution (Taylor & Jain, 2017) with or without completing an associate degree (Townsend, 2001). The vertical transfer pathway is meant to support students in their academic success (Taylor & Jain, 2017) which is the case for many students. National Student Clearinghouse (2015) data from the 2013-2014 academic year indicated that nearly half (46%) of all students who earned a bachelor's degree at a four-year institution had previously attended community college in some capacity.

The transfer function has been a core purpose of community colleges since they were founded (Cohen et al., 2014). There are scholars who make the claim that vertical transfer is the primary function of community college (Cohen et al., 2014). As a result, many community colleges still design curriculum with considerations of transfer intent to a four-year institution (Taylor & Jain, 2017). From an organizational perspective, vertical transfer is an ideal transfer

pathway for student success; however, the data indicates that there are less vertical transfer students compared to other types of transfer patterns (Taylor & Jain, 2017). More than four out of five students who start at a community college say they plan to obtain a bachelor's degree, but only about one in 13 students transfer and complete a bachelor's degree within six years (Kahlenberg et al., 2018). The large divide between those who enter community college with intentions to transfer compared to those who successfully transfer indicates that there is a vertical transfer gap (Taylor & Jain, 2017). The gap is even wider for students of color. Martinez-Wenzl and Marquez (2012) created the term "racial transfer gap," (p. 6) to show inequities in vertical transfer rates based on racial identities. Crisp and Nunez (2014) explored the racial transfer gap and findings indicated that 45% of white community college students successfully transferred compared to their African American and Latinx counterpart students with a 31% transfer success rate. Research has been done to explore measures taken that have positive impact on vertical transfer success. Jain et al. (2011) found that there was a positive impat on prospective transfer students when they participated in outreach activities where they had the opportunity to learn from students who had already transferred and who had similar racial backgrounds.

In a National Student Clearinghouse research report, Shapiro et al. (2018) reported on the six-year outcomes for students who started at a two-year public institution in a fall 2012 cohort. The findings showed that slightly under 40% of two-year college students completed either at their original institution or at a different four-year or different two-year intuition, 14.5% were still enrolled, and 46% were not enrolled anywhere (Shapiro et al., 2018). Taylor and Jain (2017, p. 277) identified "(a) credit loss, (b) inadequate articulation agreements, and (c) structural and institutional barriers" as difficulties of providing students with efficient transfer pathways. Credit loss, the loss of college credits while transferring into a new institution, impacts vertical transfer

student success (Jenkins & Fink, 2015; Taylor & Jain, 2017). Jenkins and Fink (2015) referenced a study that used a nationally representative sample of students and found that less than 60% of community college students were able to successfully transfer a majority of their credits. The study also noted that approximately 15% of the transfer students were not able to transfer almost any of their credits. The ability to transfer credits has a positive impact on bachelor's degree completion. Transfer students who successfully transferred a majority of their community college credits were 2.5 times more likely to earn a bachelor's degree compared to their counterparts who transferred less than half of their credits (Monaghan & Attewell, 2015). The study that Jenkins & Fink (2015) cited concluded that the largest barrier to bachelor degree attainment success was the loss of transfer credits.

The majority of research on the success of vertical transfer solely puts the focus on what is happening at the community college level (Bahr et al., 2013). Through only understanding the community college lens, researchers are neglecting the important position four-year institutions are in with regards to the recruitment, transition, retention, and ultimately graduating students (Aragon & Perez, 2006).

Associate in Applied Science

An Associate in Arts (AA) and the Associate in Science (AS) have traditionally been the common transfer path from community college into bachelor programs (D'Amico et al., 2021). The Associate in Applied Science (AAS) is traditionally considered a "workforce preparation pathway;" however, there has been an increase in students transferring from an AAS degree (D'Amico et al., 2021, p. 378). Kujawa (2013) found this to be true. Even though an AAS degree seeking student may have entered a program with bachelor's degree aspirations, participants found that as they spent time in their AAS programs their goals shifted. For some participants,

they entered an AAS program feeling excited, but as their time in the program went on, they started to have different thoughts on career decisions (Kujawa, 2013).

In recent years, North Carolina has seen an increase in AAS students transfer into four-year degree programs (D'Amico et al., 2021). North Carolina has seen an increase of 141% of transfer students holding other types of associate degrees, many AAS, between 2007-2017 (D'Amico et al., 2021). Despite AAS degree holders being a fast-growing transfer population, the CAA between the UNC System schools and the North Carolina Community College System does not include a transfer pathway for AAS holders (D'Amico et al., 2021). Students with an AAS still have to depend on a course-by-course transfer evaluation that limits the number of credits that can be applied to bachelor degrees (D'Amico et al., 2021). In cases where there are bi-lateral articulation agreements for applied programs, such as AAS, there is not a central location for students in North Carolina to access the list of agreements (State Board of Community Colleges & Board of Governors of the University of North Carolina, 2015).

The traditional transfer from an AA or AS degree provides students with a general education experience first, followed by transfer and taking discipline specific course work (Kujawa, 2013). Starting in an AAS program reserves the course sequence, meaning instead of starting in general education courses at community college, AAS students take courses in their discipline (Kujawa, 2013). Kujawa (2013) concluded that, for some, that reverse approach to higher education was the catalyst for engaging learners, increasing confidence levels, and ultimately leading to an interest in pursuing a bachelor's degree in the field. Kiujawa (2013) found that AAS programs should not be considered a terminal degree, but rather looked at as additional pathway to a four-year degree.

Transfer Experiences

Pre-Transfer

The socialization norms in community college can differ from that at a four-year institution (Jackson & Laanan, 2015). Empirical research does, however, support that there can be a positive correlation with some pre-transfer behaviors and post-transfer success (Allen et al., 2022; Jackson & Laanan, 2014; Wang et al., 2021). Specifically, communication and positive interactions between students and community college faculty and staff has led to favorable experiences. Jackson and Laanan (2014) found that pre-transfer students who met with their community college advisor before transfer and discussed such topics as courses and career pathways, had a higher likelihood of a positive post-transfer adjustment. Furthermore, Jackson et al. (2013) cited positive interaction with faculty and advisors in community college fostered a sense of support for Black women in STEM. Allen et al. (2022) also found that the community college environment provided favorable science and mathematics classroom experiences that resulted in positive relationships among peers.

In a study conducted among pre- and post-transfer Black women in STEM, Allen et al. (2022) found that community college advisors and instructors tried to build relationships with students. Allen et al. (2022) found that there is a culture of support within a community college environment for Black women. As a result of differing institutional aspects, students who thrived in a community college do not always have the same results after transferring into a four-year institution. Jackson et al. (2013) and Reyes (2011) have contributed to literature on the experiences of Black women in STEM post-transfer, but there is limited research on the experiences Black women in STEM have while in community college (Allen et al. 2022). Allen et al. (2022) is a notable exception of scholarly exploration on this topic.

Post-Transfer

Vast amount of literature on the role community colleges play in preparing students to transfer is available, but not nearly as much research has been conducted on the post-transfer experiences (Elliott & Lakin, 2020) or for experiences specific to women of color in STEM. Empirical research on educational interventions to support transfer students is available, but the role of baccalaureate institutions and post-transfer is often not addressed (Wang et al., 2021). Community colleges and four-year institutions both contribute to the success of transferring and continued academic success post-transfer (Bahr et al., 2013; Jain et al., 2011). To support a successful transfer experience, four-year institutions are responsible for assisting students during the transition, and help to ensure students' ability to maintain their academic success (Bahr et al., 2013).

Research on post-transfer experience has shed light on challenges transfer students have endured. Transfer students' perception of four-year institutions can include feelings of not being welcomed and viewing the environment as unsupportive and competitive (Jackson et al., 2013).

Participants in a qualitative study on post-transfer experiences expressed that they were able to navigate the necessary administrative steps needed to successfully transfer, but found that once they entered the four-year university environment they experienced difficulties (Chang, 2006). Chang (2006) found that some of their participants felt like a "third-year freshman" after transferring (p. 125). Chang (2006) identified that the transfer adjustment time period went beyond the initial transfer time period. Interviews with post-transfer students revealed that some post-transfer students did not feel they received the same campus support around adjustment as first year freshman do, and many used the word "shocked" when describing post transfer experiences (Chang, 2006).

Studies have shown that post-transfer students may experience “transfer shock” (Ceida, 2006; Hills, 1965). Hills (1965) defined transfer shock as a significant lowering in academic performance post-transfer. Transfer shock can result from students not being prepared to transfer or not receiving appropriate support after transferring (Taylor & Jain, 2017). Cejda (2006) investigated if transfer shock differed among academic disciplines and found that transfer students from mathematics and sciences experienced more transfer shock (a decline in grade point average) compared to students in different major groups.

The post-transfer experiences for students from underrepresented racial, ethnic, or socioeconomic groups may include unique challenges (Bahr et al., 2013). Transfer students from underrepresented groups might be faced with discriminating attitudes due to their race, ethnicity, socioeconomic, or gender status (Reyes, 2011). This is a particularly prominent concern for post-transfer students in majors that mainly consist of students from majority groups (Reyes, 2011). Bahr et al. (2013) identified “environmental pull” factors as potential barriers to transfer student involvement (p. 463). Environmental pull factors are the commitments students have outside of their academics that include family obligations and work responsibilities (Bahr et al., 2013). Environmental pull factors have the potential to negatively impact student persistence (Bahr et al., 2013).

Laanan et al. (2010) found that community colleges provided academic skills that proved to be helpful to the students’ “academic transfer adjustment” (p. 180). Laanan et al. (2010) referred to the skill sets earned at two-year institutions as *transfer student capital*. Learning how to note take, solve problems, and manage time are all examples of transfer student capital (Laanan et al., 2010). Laanan et al. (2010) hypothesized that the smaller class sizes in community college contributed to more peer and faculty interaction and provided space for the

development of transfer student capital that are carried into students' four-year university adjustment. Offering post-transfer programs and services specific to transfer students is significant to their success (Jackson et al., 2013) and builds upon their transfer student capital. Pre-transfer students being exposed to faculty and advisors from the transfer institution can serve as the starting point for students to build their transfer student capital (Wang et al., 2021). Transfer student capital framework also includes "other engagements with baccalaureate institutions" and "transfer-oriented activities at community colleges" as other possible ways to develop transfer capital (Wang et al., 2021, p. 107). Crisp and Nuñez (2014) recommended qualitative research as a means to gain a better understanding of white and Black, Indigenous, and people of color (BIPOC) students' access and use of different forms of capital.

Transfer Receptive Culture

Transfer partner agreements are important between two-year institutions in providing academic pathways (Fink & Jenkins, 2017), but in order to have an authentic partnership that considers transfer students' needs, there needs to be a transfer receptive culture (Jain et al., 2011). Laanan et al. (2010) found that if students felt negatively stigmatized for being a transfer student, that had an adverse impact on their academic transfer adjustment. Jain et al. (2011) see transfer receptive culture at four-year institutions as a means to aid students through providing "the support needed for students to transfer successfully- that is, to navigate the community college, take the appropriate coursework, apply, enroll, and successfully earn a baccalaureate degree in a timely manner" (p. 257). Jain et al. (2011) defined a transfer receptive culture as an institutional commitment by four-year institutions to provide support both pre- and post-transfer to ensure student success. The types of support required to promote success should begin with helping students navigate the transfer process from the time they enter community college,

through taking appropriate coursework, applying to a four-year institution, and successfully completing a bachelor's degree (Jain et al., 2011). The transfer receptive culture uses a holistic lens to view the vertical transfer function. It places the responsibility of transfer student success within the transfer sending and transfer receiving institutions (Herrera & Jain, 2013; Jain et al., 2011).

Transfer receptive culture embodies the belief that students will be successful because they are transfer students, contrary to the belief that they are successful "despite" being a transfer student (Jain et al., 2011, p. 253). Additionally, the transfer receptive culture concept places importance on the "foundation to receive students begins prior to them arriving at the institution" (Jain et al., 2011, p. 258). The identified elements of transfer receptive culture are split between pre-transfer and post-transfer. Informed by critical race theory, the following are the five transfer receptive culture elements:

1) Pre-transfer, prioritizing transfer of non-traditional students including first generation, low income and underrepresented.
2) Pre-transfer, provide outreach designed for the needs of transfer students.
3) Post-transfer, offer financial and academic support for non-traditional transfer students.
4) Post-transfer, acknowledge students' intersectional identities and lived experiences that they come with.
5) Post-transfer, design of appropriate assessment and evaluation framework of transfer receptive programs. (Jain et al., 2011)

Data indicates that there needs to be an emphasis on retention efforts with post-transfer students. The graduation rates for transfer students who started in 2010-2011 show approximately 40% who attended public institutions earned a bachelor's degree in six years

("Graduation Rates for Transfer-In Students Starting in 2010-11," 2020). That percentage drops to 34% at private non-profit institutions and lowers to 17% at for-profit institutions ("Graduation Rates for Transfer-In Students Starting in 2010-11," 2020). In order to improve transfer student graduation rates, the unique needs of transfer students' need to be addressed. The absence of a strong transfer receptive culture can result in low retention rates for the transfer student population (Jain et al., 2016).

Implementing transfer receptive culture elements can be challenging, and require the commitment from various stakeholders- faculty, staff, administration, students, and the greater community (Jain et al., 2016). Jain et al. (2016) found that transfer receptive culture building starts with placing value and importance on transfer function, while taking a deep look at the institution's programming, policies, and curriculum through a transfer lens.

STEM Education and Community College

National Need to Broaden STEM Education Participation

Wang (2020) has discussed the national shortage of people in STEM education to fill the demand of the STEM workforce. Research shows that having diverse ideas and perspectives from individuals from varied backgrounds has a positive impact on science and engineering (Blackburn, 2017; Ferrini-Mundy, 2013), and diverse experiences within STEM education and the STEM workforce is beneficial to critical thinking and problem-solving (Ferrini-Mundy, 2013). In order for the STEM workforce to actually be reflective of the United States population, there needs to be a culture of inclusion in place within STEM higher education (Ferrini-Mundy, 2013). STEM education in the United States does not fully utilize the scientific potential of all populations within the country (Ferrini-Mundy, 2013). Furthermore, in the United States there is

an increase in recognizing the need to improve the baccalaureate degree competition rates in STEM fields (Wang, 2015).

There has been an ongoing national challenge to lessen the underrepresentation of traditionally disadvantaged students in STEM (Wang, 2017). Two-year institutions have the potential to be a leader in creating structures and developing practices to support women of color and their success in the sciences (Rodriguez et al., 2016). Community colleges are affordable access institutions (Wang, 2015) that serve a disproportionately large number of historically disadvantaged students (Cohen et al., 2014), putting them in a unique position to open doors to STEM education to a diverse student groups pursuing baccalaureate degrees in STEM (Wang, 2015). Since community colleges have a disproportionality large enrollment of racial/ethnic minority students (Cohen et al., 2014), they are positioned to lessen the underrepresentation of historically disadvantaged students in STEM through the upward transfer mechanism (Wang, 2015).

Pathway to STEM Baccalaureate

There is a complexity to the STEM transfer process (Wang, 2017). Student success in STEM disciplines at community colleges is not the same compared to students who start at a four-year institution (Wang, 2015). Transfer students in STEM majors often experience unique challenges. STEM programs have a very structured curricula and rigorous academic requirements that amplify some larger inequities within advising and student transfer outcomes (Wang, 2020). The academic demand in STEM at community colleges may not match the academic rigor in STEM at four-year institutions; however, there is still the potential for community colleges to have an impact in diversifying STEM baccalaureate degree holders (Jackson et al., 2013; Wang, 2015). There is little knowledge on the effect of obtaining a

baccalaureate degree in a STEM major for students who start at a community college (Wang, 2015).

In 2003-2004, 40% of community college students with declared majors and intent to transfer were in STEM disciplines, and out of this group 36% were from students of color and other underrepresented student groups (Wang, 2013). Wang's research indicated that there is a pool of students in STEM from community colleges; however, the rates of success post-transfer shows a gap (Wang, 2020). The reality is that only 12% of all students with transfer aspirations within STEM majors at two-year institutions successfully transferred within six years (Melguizo et al., 2011).

Wang's (2020) past research and data analysis has found that community colleges do, in fact, show promise in increasing access to baccalaureate programs in STEM majors for traditionally underrepresented students through upward transfer. Community colleges are positioned to offer students knowledge of STEM career and academic possibilities (Jackson et al., 2013). Jackson et al. (2013) identified programming, such as first semester seminars and workshops, as ways community colleges can engage students in STEM education pathways.

STEM Transfer Model

Wang (2017) developed the STEM Transfer Model to understand the factors that influence transfer in STEM. Wang's (2017) STEM transfer model is placed at the intersection of individual, motivational, learning, and contextual factors that have the potential to shape the outcomes of transfer in STEM. In this model, STEM transfer is subject to the intersection of the person's inputs, contextual factors, and learning experiences within STEM and what they believe to be motivational related to STEM education and transfer (Wang, 2017). The STEM Transfer Model is both novel and unique, as it is the first theoretical framework that takes STEM transfer

as the specific outcome and the first framework that includes factors that are specific to the learning and motivational beliefs within a STEM context (Wang, 2017). Wang's (2017) STEM Transfer Model includes "person inputs" defined as a person's demographics, prior academic abilities, and their initial attitudes (p. 51). Race and socioeconomic status inequalities in transfer rates are more significant in STEM fields and have to be regarded when looking into the factors that shape STEM transfer (Wang, 2013). The model extends to the transfer into a four-year institution and post-transfer experiences, highlighting the need to support STEM transfer students after their successful transfer into a four-year STEM major (Wang, 2017). This framework can be used as a reference for future research on better understanding the complexities of upward transfer in STEM for students, many of whom are from traditionally underserved populations (Wang, 2017). It is important for the success of underrepresented students in STEM at community colleges to expand on the knowledge of the STEM transfer pathway (Wang, 2017).

STEM Momentum

Wang (2015) developed a notion of STEM momentum that is defined as, "academic behaviors and efforts students exhibit in early STEM coursework that propel them forward toward persistence and success in STEM fields of study" (p. 377). Wang's STEM momentum theory positions itself in the idea that if momentum is lost early it will result in a decrease in community college students who aspire to obtain a baccalaureate through upward transfer. Wang's (2015) theory on STEM momentum was developed to better understand if and how STEM momentum impacts STEM baccalaureate success. The STEM momentum concept considers the behavior one has early on in their academics and the effort they have demonstrated

in STEM coursework (Wang, 2015). STEM momentum may be a vital component that is the starting point to eventual STEM transfer (Wang, 2017).

Wang (2015) found that, in general, community colleges have not yet become a pathway to baccalaureate in STEM compared to four-year institutions; however, study findings concluded that STEM momentum does matter and highlights that early success in achieving STEM momentum puts students on a positive pathway towards baccalaureate obtainment. Study results further highlighted that beginning at a two-year institution not only does not negatively impact STEM momentum, but it actually improved STEM quality points. STEM momentum, coupled with completing a large number of STEM courses with quality points received in courses, is more likely to reduce the negative impact of starting at a community college. There is a STEM success gap between students who start at a two-year institution compared to those who begin at a four-year institution, but community colleges show that they have a stronger capacity to help students with STEM momentum in their first term (Wang, 2015).

Upward Transfer in STEM Majors

Transfer has so many complexities between the different types of transfer pathways and unique experiences, but there is not much empirical research that explores these differences (Taylor & Jain, 2017). The role of advising is among the complexities of transfer experiences. Community colleges offer many programs and course offerings. Without sufficient advising, when students are faced with many program choices, they might not make the best decision (Bailey et al., 2015), resulting in a lasting impact on their transfer intent. Advising while in community college is closely connected to success. Hatch and Garcia (2017) found that there was a positive association with newly enrolled transfer intent students and their persistence through accessible advising that focuses on creating an academic pathway. Particularly with

students in STEM, there is an importance to understand transfer intent and academic behaviors (Chan & Wang, 2020) because there are additional challenges that are specific to STEM students. STEM courses are known to be academically demanding (Packard et al., 2011; Wang, 2020). In addition, not all community college STEM courses are transferable into a four-year university (Wang, 2017).

Early exposure to advisors and faculty has long-term, positive impact on students' educational aspirations, including transfer intent; but there is little knowledge available on early transfer intent and contact to faculty and advisors from baccalaureate serving institutions (Wang et al., 2021). Research findings have indicated that STEM transfer students experience a greater adjustment to a four-year university when they have regular contact with faculty and advisors at both the community college and university levels, in combination with a positive self-identity as a transfer student (Lopez & Jones, 2017). Wang et al. (2020) explored how early exposure to faculty and advisors at baccalaureate institutions connects to upward transfer, and they developed a conceptual framework that shows transfer outcomes being determined by the student developing a transfer student capital.

Wang et al.'s (2020) study findings revealed that the chances of transferring to a four-year institution among students who experienced early exposure to faculty and advisors was 1.8 times that of those who did not have early exposure. Findings concluded that early exposure has a positive effect on upward transfer. Furthermore, Wang et al. (2020) recommended that faculty and advisors become active in transfer partnerships and not put all the responsibility on pre-transfer students to contact baccalaureate institutions.

Women of Color in STEM Majors

Reyes (2012) reported that many women of color enter post-secondary education through community colleges, placing two-year institutions in a position to introduce them to STEM education. The concern is that there is only a limited amount of research on their experiences as women of color STEM transfer students. The understanding of lived experiences will better help recruitment and retention efforts for women of color STEM students pre- and post-transfer (Reyes, 2012).

Barriers that Women of Color Encounter in STEM

As an entry point into higher education, community colleges have promise to increase women of color representation in STEM education and the STEM workforce. Hu & Ortagus (2019) suggested that there are barriers specific to women in STEM and that community colleges offer a preferable pathway for women to successfully overcome those barriers. There is a need to both understand the specific challenges women of color encounter and develop strategies to support them while they are in the process of earning their degree (Reyes, 2011).

Women who enter into a STEM major are more likely to leave their program for a non-STEM field of study compared to men (Wang, 2020). There is a range of unique challenges that contribute to barriers to success for women of color pursuing STEM degrees. Notable difficulties include negative academic experiences (Bottia et al., 2015) including a lack of self confidence in mathematics (Wang & Degol, 2017). Blackburn (2017) found a rising theme of a “chilly climate” in all levels of university for women in STEM (p. 243). Jackson and Laanan (2014) discovered that the adjustment gap for women transfer students in STEM was greater compared to men counterparts. Women reported more difficulty adjusting to academics in a four-year institution (Jackson & Laanan, 2015). Women of color may encounter additional barriers such as

experiencing a negative environment that consists of stereotypes and biases suggesting that they do not belong in STEM (Reyes, 2011). It can be challenging for women of color to view themselves as a scientist and develop a science identity when they often face issues related to sexism and racism within science (Carlone & Johnson, 2007). STEM culture is often considered to be competitive and individualist, characteristics that are the result of normative behavior of white men, who have historically been the dominant group within STEM (Johnson et al., 2011). In many cases, women of color do not see others who look like them or have a similar background in the sciences (Rodriguez et al., 2016). Furthermore, there is a lack of women of color who can serve as scientific role models (Rodriguez et al., 2016).

Underrepresented groups in STEM have unique sets of challenges, but for women transfer students, the barriers are compounded when the acknowledgement of the intersection between gender and race is considered (Jackson et al., 2013). In addition to success barriers from within the college itself, women of color may have external barriers that impact persistence. Reyes (2011) found that women of color frequently hold jobs while being part time students. Many are often first-generation students, which has barriers within itself (Chang, 2006). Additionally, they may have family obligations and gender-specific expected roles to fulfill (Chang, 2006).

Allen et al. (2022) explored the intersection between gender, race, and class for Black women pre- and post- transfer students. In their study, all seven participants ultimately left STEM or reported being unhappy in STEM, and their socioeconomic status varied amongst the participants. Allen et al. (2022) noted that gender and race systemic barriers impacted the women's desire to remain in STEM, and for some that was worsened by lower socioeconomic status.

Power of Mentorship and Counterspaces

The probability of women of color persisting in STEM increases when students integrate within the STEM community environment in which they are in (Rockinson-Szapkiw et al., 2021). Carlone and Johnson (2007) found that a sense of belonging greatly informs STEM persistence for underrepresented groups in STEM. Furthermore, there is a connection between a sense of belonging, mentorship, and self-efficacy (Rockinson-Szapkiw et al., 2021). Ong et al. (2018) and Rainey et al. (2018) argue that women in STEM majors who lack a sense of community will often change to non-STEM majors. Dawson et al. (2015) argue that a crucial benefit to mentoring is how that relationship provides psychosocial support that can help counteract stress and the feeling of not belonging that some women experience. There is a growing body of literature that highlights the positive correlation between mentorship and counterspaces and persistence in STEM for women from underrepresented groups (Carlone & Johnson, 2007; Ong et al., 2017; Rockinson-Szapkiw et al., 2021).

Sense of belonging for women of color is closely connected to positive experiences within the racial climate (Johnson, 2012). Community colleges could utilize "targeted programming", for example mentorship or learning communities, to create a community for women of color in sciences that could result in helping women of color scientists meet each other and also assist in overcoming the barrier of feeling isolated (Rodriguez et al., 2016, p. 235). Valenzuela (2006) found that when programming was not available for women of color to come together to discuss how to balance the rigor of their STEM program while balancing outside of school responsibilities, some women of color shared that that they assembled and created their own support communities.

Research has been gathered on the positive impact social and academic communities have on women of color's academic persistence. This type of gathering, where students self-organize together, has been coined counterspaces. Solorzano et al. (2000) described counter-spaces as safe spaces for members of marginalized groups to gather for both social and academic purposes. Counterspaces can provide a space for African American students to share experiences and frustrations with microaggressions outside of the boundaries of a formal academic space (Solorzano, et al., 2000). Solorzano et al. (2000) conducted a qualitative research study to understand how African American students experienced the racial climate within their own college setting. Data from focus groups found that African American students used counter-spaces as a safe place in response to challenge microaggressions that they encountered (Solorozano et al., 2000). The focus group participants described the counterspaces as places with a "positive collegiate racial climate" (Solorozano et al., 2000, p. 70). Counterspaces are safe social spaces that have the power to contribute to the persistence of women of color in STEM (Ong et al., 2017). The support that women of color feel within counterspace participation can provide a sense of belonging, something they may not be experiencing within the boundaries of traditional academic spaces (Ong et al., 2017).

Jackson (2013) found that support systems have a positive correlation with women deciding to pursue a STEM area of study. Mentoring is an example of a support system that is often found within higher education institutions. Specific to transfer, mentorship relationships for women in STEM disciplines have proven to be beneficial (Jackson & Laanan, 2015). Jackson (2013) studied the relationship between support systems and academic success with women transfer students in STEM. Findings from Jackson's (2013) study reported that the community college faculty members served as positive mentors. Faculty were encouraging and also shared

knowledge on career pathways and contributed to feelings on belonging for women through validating their interests in the pursuant of STEM (Jackson 2013). Jackson and Laanan (2015) noted that in order to broaden participation in STEM among transfer students, there needs to be an understanding of the academic and social transition experiences. Mentors who have shared similar experiences are better positioned to understand the needs of the student.

There is evidence that suggests that when there is a lack of mentoring for STEM students there is a higher probability of attrition rates increasing (Dawson et al., 2015). Mentoring has proven to be very beneficial for both the mentor and mentee, but there has not been much research devoted to the benefits of mentoring for women of color (Rockinson-Szapkiw et al., 2021). As a result of few women in STEM education, there is a limited number of women who can provide mentorship to other women of color in STEM (Dawson et al., 2015).

Women of Color Post-Transfer Students in STEM

Little is known about the student experience in STEM education and the pathway to transfer (Wang, 2020). The transfer function at two-year institutions is vital to the efforts of increasing the representation of women of color in STEM baccalaureate programs (Jackson et al., 2013). Women and underrepresented racial and ethnic groups are largely represented in community colleges, making the need to understand their transfer experiences imperative (Jackson et al, 2013).

After a successful transfer, there is still an urgent need to focus on retention. Data indicates that the retention rate of women of color in STEM majors is low (Reyes, 2011). There is a “transfer student stigma” that women of color in STEM experience (Jackson et al., 2013, p. 71). There are often negative feelings towards transfer students and their academic performance capabilities, but that unfounded claim goes against the research on the academic performance of

transfer students (Jackson et al., 2013). In actuality, data indicated comparable academic ability between transfer and non-transfer students (Jackson et al., 2013). In situations when women of color in STEM are not retained post-transfer, it reflects a loss of someone with the potential to contribute to STEM (Reyes, 2011).

Post-transfer women of color may experience transfer shock, a lack of social capital, age discrimination, and have issues with the expectations that their families place on them (Reyes, 2011). Reyes (2011) found that transfer shock and feelings of isolation were lived experiences women of color expressed. The institutional culture shift, from the size of classes to academic rigor, influences feelings of discomfort. Transfer students have reported feeling invisible in large lecture courses found at four-year universities (Chang, 2006). There are numerous hurdles that women of color in STEM may be faced with post-transfer, but Reyes (2011) found that when transfer students persevered through their initial issues at a four-year institution, that indicated they were on the correct path to successful degree completion.

Students' identity has a role in transfer success achievement (Taylor & Jain, 2017); however, there are limited studies on the intersection of race/ethnicity and gender for science students (Carlone & Johnson, 2007; Ong et al., 2011; Rodriguez et al., 2016). In order to understand challenges that women of color experience, it is important to understand to role of intersectionality (Rodriguez et al., 2016) as it relates to race/ethnicity and gender. An intersectional approach to exploring the experiences of women of color in STEM is a way to avoid simplifying the complex identity experiences for women of color within the sciences (Rodriguez et al., 2016). Women of color face an intersectional challenge in STEM, stemming from being women in predominately men disciplines, paired with underrepresented racial and ethnic identities (Jackson et al., 2013).

Intersectionality and Higher Education

The History of Intersectionality

In 1989, Crenshaw coined the term intersectionality to show how institutional systems within the United States often see identities as being isolated that leads to "theoretical erasure" (Crenshaw, 1989, p. 139) of Black women who have more than one minoritized identity (Carbado, 2013; Crenshaw, 1989; Nash, 2008). Crenshaw used the concept of intersectionality as a way to frame the disparaging treatment of Black women in antidiscrimination law (Carbado, 2013) and moved away from the "single categorical axis" framework that often leads to limiting research to experiences of those from privileged groups (Crenshaw, 1989, p. 140). Intersectionality can be defined as "the commitment to centering research and analysis on the lived experiences of women of color for the purpose of making visible and addressing their marginalization" while challenging the current state of affairs in mainstream institutional structures (Alexander-Floyd, 2012, p. 9). Crenshaw put the name of intersectionality to the pre-existing ideas from Black feminist scholars on the interlacing of race, gender, class, and sexuality (Nash, 2008).

Crenshaw's early work on intersectionality looked at how the needs of Black women was between feminist discourse, that put emphasis on white women, and antiracist discourse, that put Black men as the focus (Harris & Patton, 2018). In the early 1990's, Crenshaw continued to develop her intersectionality theory and expanded to include three forms of intersectionality and how they relate to women of color: "structural intersectionality, political intersectionality, and representational intersectionality" (Harris & Patton, 2018, p. 351).

Intersectionality is used today as a lens that questions racial, ethnic, socioeconomic class, ability, age, sexual orientation, and gender inequalities, and challenges the ways of viewing

structures of inequity within systems (Dill & Zambrana, 2009, p. 1). An intersectionality framework includes the need for transformation. Scholars who use intersectionality as an analytical tool explore intersectionality from the micro (individual social identities) and macro (institutional structures) analytical prospective (Harris & Patton, 2018). A complete intersectionality analysis considers individual lived experiences and how those experiences are positioned within systems of inequality (Crenshaw, 1989).

Intersectionality as a Framework in Higher Education Research

The intersection between racism, classism, and sexism can be looked at through an intersectional framework as a way to interrogate how this intersection informs policy that has an impact on the experiences of people of color within higher education (Harris & Patton, 2018). Intersectionality is often referenced in scholarly, higher education empirical research, but many lack an "exploration of intersectionality" (Harris & Patton, 2018, p. 358) that considers the context and inequalities that are embedded in it.

Harris and Patton (2018) found that higher education scholars who use intersectionality as a framework, often conduct qualitative research and seek to understand the lived experiences of BIPOC students. Intersectional analyses that put emphasis on and show the merging of power, privilege, and whiteness within postsecondary systems may contribute to transformational social justice change (Harris & Patton, 2018). In order to produce radical change, higher education scholars need to go beyond using an intersectional approach just to provide information about BIPOC, and expand on their intersectional frame to analyze where power, privilege and oppression are within higher education systems (Harris & Patton, 2018).

Crenshaw (1989) emphasized the intersection of social identities and the connection between them and institutional and structural oppression embedded in society. Higher education

scholars often incorrectly define intersectionality by not making the connection between the multiple identities people hold and that relationship with structures of oppression, that results in the use of intersectionality as more of a "buzzword" (Harris & Patton, 2018, p. 352). Intersectionality needs to be explored from the micro (individual social identities) and macro (institutional structures) analytical lens (Harris & Patton, 2018).

Social divisions that are apparent within the institution of higher education are, in part, the result of power relations between class, race, gender, ethnicity, citizenship, and sexuality (Collins & Bilge, 2020). College and university campuses have become increasingly more diverse and have students with vastly different experiences who seek fairness (Collins & Bilge, 2020). Higher education institutions started to recruit and serve targeted student groups, such as African Americans, veterans, first-generation, and Latinx groups, but the single-student-group approach does not address student needs for those who fit into more than one group (Collins & Bilge, 2020). In this context, higher education systems can use an intersectionality framework as a way to rethink and develop ideas and practices towards equity on campus (Collins & Bilge, 2020). A complete intersectionality analysis considers individual lived experiences and how those experiences are positioned within systems of inequality (Crenshaw, 1989). Intersectionality is a theory that can be used in higher education research for the promotion of social justice within postsecondary education (Harris & Patton, 2018).

Identity and Women of Color in STEM

There is a concern of persistence for women of color in STEM education. Women of color do not persist in STEM majors at the same rate as their white men counterparts in part because they lack the sense of belonging within STEM (Carlone & Johnson, 2007; Ong et al., 2011; Valenzuela, 2006). Identity development models, such as the RMMDI, can be used as a

tool to gain a deeper understanding of women of color's self-perceptions of their salient identities and the contextual influences that have an impact.

Individuals are multi-dimensional and have many identity dimensions. The RMMDI provides a framework to gain greater understanding of identity development that considers the context, identity self-perception, and the filter in which meaning-making is done (Abes et al., 2007). Contextual influences, such as family, can impact how one makes-meaning of their own identities (Abes et al., 2007).

Women of color may experience microaggressions because of several overlapping identities such as race, gender, age, ethnicity, first-generation student status, and socioeconomic status (Reyes, 2011). An intersectionality lens can facilitate a better understanding of identities and reflection on the contrast between identities connected with power versus those tied to oppression (Johnson et al., 2011). For educators, exploring student identities (including race, gender, religion, and sexual orientation) with an understanding of the role of intersectionality and how students make meaning of their identities, allows for the consideration of students' lived experiences and how that informs decision making (Johnson et al., 2011). The intersection of gender, race, age, and ethnicity may contribute to women of color transfer students' sense of belonging (Reyes, 2011). Malcom et al. (1976) found that the discrimination toward women of color scientists made them the least valued among other underrepresented groups in STEM. The multiple identities (race, gender, ethnicity, sexual orientation, and socioeconomic) that students hold makes it a challenge to pinpoint a specific barrier without considering the several identities students have and their experiences (Blackburn, 2017).

Conclusion

Since their development, community colleges have served as institutions that offer accessible and affordable education to the vast population within the United States. Data has been collected that supports findings that community colleges can have a great influence on increasing and broadening STEM education. Study findings continue to support the important role community colleges play in increasing access and success in STEM education to a diverse population.

Over the last 20 years, researchers have sought to understand the transfer function and the intricacies of the transfer student experience (Laanan et al., 2010). This study hopes to contribute to the body of knowledge on transfer, and add to what is known about women of color and their transfer experiences within STEM majors. This qualitative study will seek to understand the lived experiences of women of color pre- and post-transfer students. Additionally, this study seeks to explore the connection between social identities, contextual influences, and self-perceptions of identity.

The research reviewed in this chapter supports the need for continued research exploring how community colleges can be a successful pathway to baccalaureate degree attainment for women of color in STEM. The literature reviewed supports the argument that women of color in STEM encounter unique barriers that can hinder their transfer intent aspirations and pre- and post-transfer success. Furthermore, the literature supports that grounding the study in the RMMDI, facilitates deeper understanding of the lived experiences of women of color transfer students.

CHAPTER THREE: METHODOLOGY AND RESEARCH DESIGN

Introduction

Since the early 2000's, there has been a national narrative that the number of students entering into STEM education is inadequate to fulfill the STEM workforce demand. This well documented concern has prompted a call to broaden participation in STEM (Hernandez-Gantes & Fletcher, 2013). The issue of the need to fulfill the STEM workforce demands and need to broaden participation in STEM is extremely complex. Hernandez-Gantes and Fletcher (2013) identified that there is a fractured system in K-12 education, community colleges, universities, and workplace informal education. In this study, I do not seek to address the disjointed nature of the four educational contexts that Hernandez-Gantes and Fletcher (2013) identified, but rather narrow the focus on community college and four-year institutions and examine the experiences of women of color transfer students in STEM majors.

Purpose and Research Questions

The purpose of this study is to understand the transfer experiences of women of color in STEM majors from community college into a four-year degree program. This study also explored how social identities are connected to experiences in higher education and transfer processes for women of color in STEM majors. Abes' et al. (2007) reconceptualized model of multiple dimensions of identity (RMMDI) guided this study. RMMDI provides a framework to explore the connections between contextual influences, self-perceptions, and how students make meaning of their dynamic identities (Abes et al., 2007). This study explored the role of multiple identities, such as gender, race, and other social identities, and the relation between identities, the context, and the impact on vertical transfer experiences.

The following questions guide this research study:

RQ1: How do pre- and post-transfer women of color in STEM majors experience the transition into a university from community college?

RQ2: How do social identities inform STEM-related experiences for women of color in STEM majors?

This chapter describes the study design, providing details on the methodology, researcher's positionality, ethical considerations, sample, data collection, data analysis, and limitations.

Epistemology, Methodology, Design, and Rationale

This study is a qualitative phenomenological study that incorporates a constructivist worldview as a way to guide the study. The following section discusses the epistemology, methodology, and design. Additionally, the rationale behind the choices of these approaches is described.

Constructivist Paradigm

A paradigm can be described as the way one views the world (Mertens, 2020). Through the determination of a paradigmatic lens, researchers have perspective that helps guide thought processes and actions (Mertens, 2020). Guba and Lincoln (2005) believe the makeup of paradigms are basic beliefs around axiology, ontology, epistemology, and methodology.
For my study, I was guided by the constructivism paradigm. A constructivist paradigm view is aligned with the researcher's basic beliefs. The researcher's axiological belief lies within the belief of valuing balanced and diverse perspectives. The ontological nature of the study is that knowledge is socially constructed by multiple people who are part of the research process (Mertens, 2020). The epistemological point of view for the study is that there is an "interactive link" (Mertens, 2020, p. 11) between the researcher and study participants. The researcher

believes that there is a relationship between participants who provide the data, and the researcher who turns the data into findings, making research never fully objective. From an epistemological constructivist stance, the researcher may want to strive for a level of objectivity, but acknowledges the lived experiences and social constructs that we live in make it not possible to be purely objective. As part of being reflective and ethical, I considered the relationship between myself and the participants, and the power dynamics within that interviewer/interviewee relationship.

Researchers who use constructivism to guide their research want to understand the lived experiences and perceptions from the participants, those who lived it (Mertens, 2020). The constructivist epistemology places emphasis on understanding individuals' lived experiences, which is closely connected with phenomenological approaches. Vagle's (2018) post-intentional phenomenological approach incorporates the belief that phenomena can also be observed through a combination of individual experiences, and as the phenomena moves through social constructs. The data collection methods typically involved within constructivism are interactive and include interviews, observations, and document reviews (Mertens, 2020). As a qualitative phenomenological study, my study will use interviews as the primary source of data collection, and will be described in detail later in the chapter.

Rationale for Qualitative Phenomenological Design

The purpose of this study is to gain an understanding of the lived experiences women of color had in college, their transition, and as post-transfer students in STEM majors. Each participant in the study shared some commonalities, such as a shared gender identity and having had experience at a community college. A phenomenological approach employs the assumption

that individual experiences within a phenomenon and the specific phenomena itself are not interchangeable (Vagle, 2018).

Phenomenology as a research methodology seeks to gain an understanding of "what it is like as *we find-ourselves-being-in-relation-with others* and *other things*" (Vagle, 2018, p. 20). There is a point of view that people themselves do not create the phenomenological experience, but rather are in an experience (Vagle, 2018). As a phenomenologist, I seek to understand how pre- and post-transfer students find themselves and their experiences in relation to the phenomenon of transfer transition, while considering the social structures embedded in transfer processes.

Post-Intentional Phenomenology

Descriptive, interpretative, and reflective lifeworld are all varying types of approaches to phenomenology. For this study, I took a reflective lifeworld phenomenological approach with study design, data collection, and data analysis. The foundation and origins of phenomenology came from the philosophical teachings of Edmund Husserl in the early part of the 20th century (Vagle, 2018). At the core of Husserl's phenomenological belief was that a phenomenon had an essence that could be explored (Vagle, 2018). Since Husserl's groundbreaking phenomenological work, many philosophers have built upon beliefs in ways to approach this methodology. Vagle (2018) took a reflective life world approach, slightly deviating from the Husserlian and Heideggerian phenomenological methods, and created a "post-intentional" approach (p. 45). Vagle's (2018) understanding of phenomenological research places the phenomena as something belonging to a larger social stratum, not just to the individual. Parallel to the constructivist paradigm's position that reality is socially constructed (Mertens, 2020), post-intentional phenomenologists view phenomena as socially created (Vagle, 2018).

Vagle's post-intentional phenomenological inquiry differs from Husserl's traditional phenomenology that does not use theory to guide a study. The RMMDI was used as a theoretical guide, which also impacted the researcher's decision to use a post-intentionality phenomenological approach. Post-intentional phenomenology leaves open possibilities between phenomenology and theories (Vagle, 2018). Review of literature on RMMDI and intersectionality was completed prior to study design and data collection. The use of the RMMDI guided me throughout the duration of the study.

Post-intentional phenomenology encourages researchers to consider the positive impact their research can have on social change. Vagle's (2018) crafting of post-intentional phenomenology included the belief that a phenomenological philosophy can be used in social change efforts. Vagle best described the importance of considering social change when he said, "This is important to post-intentional phenomenology as a philosophy for social change as the connective nature of social, ethical, and political relations does not lend itself to simplicities and essences. It does lend itself to complexities and tentative understanding" (Vagle, 2018, p. 135). Phenomenological philosophy historically is considered "apolitical," but researchers such as Vagle have crafted versions of phenomenology that connect a "dialogue" between theory and phenomenology as a methodology to address real and important societal concerns (Vagle, 2018, p. 137). The coupling of the RMMDI and a post-intentional phenomenological approach, allowed me to explore the unique individual experiences of pre- and post-transfer women of color, while also taking those experiences and placing them within the context of transfer student processes and policies, and explores individual identity development and contextual influences.

Researcher's Role and Positionality

In qualitative research, the researcher is the primary instrument. Furthermore, the act of being reflective is critical in a phenomenological study. The following section is a summary of the researcher's subjectivity statement. In addition to crafting a subjectivity statement, I wrote in a reflective journal throughout the duration of the study.

Subjectivity Statement

My interest in transfer experiences for women of color in STEM was the result of being introduced to community college research, rather than myself having a personal experience with community college. My pathway to higher education was a nontraditional path, that included transfer experiences, but not from a community college. As I reflect back on decisions I made about pursing a higher education, I was very much in a place of privilege. I am a white woman who was raised by upper middle-class parents. Both of my parents and some of my grandparents earned college degrees.

As an undergraduate student, I earned credits from four different four-year universities. In more recent years, I have spent time reflecting on my privilege, having the freedom to stop-out, and reenter higher education at my own pace. I see that the freedom I had with educational decisions was afforded to me, in part, because I had a financial safety net. I had financial support throughout my entire bachelor's degree journey from my parents. That support removed what would have been a substantial barrier to completing my bachelor's degree.

My interest in community college, underrepresented student success, and diversifying STEM education started during my time as an employee and graduate student at the University of North Carolina at Charlotte. My professional position within a bioinformatics and genomic department provided insight into seeing the importance of diverse perspectives in enhancing the

quality of research. I have attended conferences, poster symposiums, and recruitment events with the goal to learn about ways to broaden participation in STEM and why it is vital to science.

As a doctoral student, I had the opportunity to explore and gain a deeper knowledge about community colleges. That exploration led me to me think more about how wonderful the idea of community colleges are as affordable access institutions, while also being disturbed by the lower success rate of bachelor degree attainment for those who enter higher education through community college. My exploration of community college and the transfer function, also led me to think about how community colleges have a potential to introduce and bring a diverse student population into STEM majors. My research topic development and passion grew out of a place of being informed through extensive literature review, rather than a personal experience.

The process of reflection on my positionality within my research has been fluid and on-going. I do not have personal experience with being a community college transfer, nor is my racial or ethnic background underrepresented in STEM, but I do have a strong interest in transfer student success and desire to gain better understanding of institutional policies, structures, and norms that continue to create barriers for underrepresented groups in STEM, and success in transferring into four-year degrees. Being an outsider to my research interest, I think about my point of view and how not having a personal experience can influence my interviews. As an outsider, I felt that it was important to tell participants about my background and what drew me to being a part of a research team that studies transfer student success. As a graduate student who was part of a research group and participated in study interviews, I found that although in many ways I was an outsider, there were also times when I connected to interview participants on a different level. For example, while interviewing a mother, I was able to make the connection between also being a working mother and student. In another interview, I found commonality

between myself the participant because, I too, was a non-traditional student in regards to the age I was when I completed my bachelor's degree. As I continued collecting data for this study, I explored my interests in the research topic and looked for ways to connect with participants.

In addition to thinking about my positionality within the subject matter, it would be remiss of me to not consider my positionality as part of a larger research team and consider how that has an impact on my research purpose and questions. As a doctoral student, I am a part of a North Carolina statewide qualitative study on transfer students that has financial support from the John M. Belk Endowment. Part of the data collection for my study was the result of data from the larger transfer study. I am extremely fortunate to be part of a research team studying transfer processes, pre- and post-transfer student experiences, and understand identities and their relation to equity issues, but in return that does mean that I did not have direct control over every aspect of study. My research purpose and questions deviate from the larger study's; however, specific questions in the interview protocol align with information I sought to explore to get a better understanding of from woman of color students who have experienced the phenomena of transferring as a STEM major. I had to balance aspects of the study that I did not have direct control of and reflected on ways to be flexible, while also staying true to my research interests. In the end, I do feel comfortable in believing I was able to strike that balance. I will elaborate on specific ways the larger study influenced my individual study, and the tactics I employed in the data analysis to remain focused on my study purpose and questions in the following sections of this chapter.

Ethics and Human Subjects Protection

This study presented minimal risks to study participants; however, there were some ethical considerations that will be addressed. Questions that can be sensitive in nature about

intersecting gender, socioeconomic status, racial, and ethnic identities were asked during interviews. At the start of each interview, participants were reminded that they can choose to not answer any interview question and that they were able to stop the interview at any given time. They received information about the study via email prior to participation.

Participants were given and asked to sign informed consent forms before participating in interviews. The consent forms notified participants that, as participants, their involvement in the transfer student study and STEM interview is voluntary, and they have the right to withdraw from the study at any point. The informed consent was briefly reviewed at the start of the interviews, reminding the participants that the interviews were going to be recorded and that the interviews were confidential. In the larger transfer study, each participant was given a participant number. Furthermore, I assigned pseudonyms that were used in all written data analysis and findings for this study.

Sample and Population

The data collection sample in this study comes from the data that was collected from participants recruited from the larger statewide qualitative study of North Carolina transfer students. The larger study interviewed 103 students, 39 pre-transfer students, and 64 post-transfer students. The aim was to have a representative sample from North Carolina community colleges, University of North Carolina (UNC) system campuses, and North Carolina Independent Colleges and Universities (NCICU). Targeted institutions that were reached out to for recruitment represent higher education institutions that offer a wide range of majors, and are diverse in location. A purposive sample method was used to help in having a pool of participants from varied backgrounds, including diversity in college generation status, race and ethnicity, geographical regions, degree type, and major choice.

Recruitment for a large-scale qualitative transfer student study requires a high level of outreach and organization. The primary investigators (PIs) in the larger study compiled a list of North Carolina community colleges, UNC system institutions, and NCICUs. The institutions were entered into an Excel spreadsheet. Intuitional descriptive information including the Carnegie classification, region, percentage of Pell Grant recipients, distress tier, and top destination ratings were included in the Excel sheet. Institutions that have students who were targeted to be included in the study were contacted. Signed letters of commitment were collected by the institutions who agreed to participation. The letters of commitment indicated that the institution would provide support and send out recruitment messages to students. The participants selected to participate in the study had an initial interview in year one (Y1), and follow-up interviews in the second year (Y2) to gain an understanding of their movement towards transfer aspirations and bachelor's degree goals. Data for this study were collected from a subset of the participants from the larger transfer study. This is described in the following sections.

Data Collection

The primary data collection for the larger statewide qualitative study of North Carolina transfer students was interviews. Students received email communication about this study from their current higher education institution. Interested students responded to the study recruitment email. A purposive sample was used to recruit a sample that is diverse in geography, majors, generational status, race and ethnicity, degree type, and major. Prior to the interviews, selected participants received an informed consent form. Participants in the larger study received a $50 Amazon gift card after each interview. As part of the larger transfer study, each study participant was asked to be interviewed once in Y1 and then again in Y2 of the study. A semi-structured

interview, that was guided by an interview protocol, was used in all interviews. Each interview was conducted by one or two members of the research team. All interviews were on the Zoom meeting platform. A PowerPoint presentation was used during the Y1 and Y2 interviews that included the interview protocol questions. The PowerPoint slides allowed the participant and researchers to see the questions. Some probing questions were on the slides, but the interviewers did ask additional questions when appropriate. Each interview was approximately 60-90 minutes.

Interviews in phenomenological studies are traditionally unstructured (Vagle, 2018), but semi-structured interviews can be utilized as a way to keep a focus on the research purpose and questions. Another advantage to a semi-structured interview is that it allows for relevant follow up probing questions that provides the interviewees the space and time to elaborate on their thoughts and experiences. As a research team member of the larger transfer study, I was one of the interviewers in Y1 and Y2 interviews. As scheduling allowed, I attempted to be a part of several interviews with students who fit my study's eligibility requirements. Regardless of if I was an interviewer with the women from Y1 and Y2 interviews, I used the interview data sets from participants who met this study's eligibility requirements in my data analysis.

Phenomenological studies often employ more than one interview per participant (Vagle, 2018). Participants from the larger study who met my study's eligibility requirements that provided data that is relevant to my research questions were asked to participate in an additional interview with only me, not the rest of the research team. An amendment was added to the larger transfer qualitative study's Institutional Review Board (IRB) protocol that gave permission to ask interviewees to participate in an additional interview as part of a secondary study. Participants who met the eligibility requirements of my study were asked if they would be willing to have a follow up interview between the Y1 and Y2 interviews. The follow up

interview that was part of this study, that I refer to as the STEM interviews, were on Zoom and the use of an interview protocol guided those interviews.

The STEM interview protocol was designed to capture experiences specific to STEM. Some of the questions around social identities and educational background were similar to the Y1 interview questions, but the STEM interview asked for participants to consider the questions with the frame of being in STEM. The interview protocol was designed for the interviews to last approximately 45 minutes to one hour. The interviews ended up being between 38 minutes and a little over one hour. There were 21 questions in total that were part of four sections: background on interest in STEM, social identities, classroom experiences, and advice and closing. The interview protocol was written after I completed an extensive literature review on transfer experiences and women of color in STEM. Prior knowledge did inform some decisions on the types of questions I wanted to ask. Each question was open-ended to give space for a non-pre-determined response. Questions regarding social identities and classroom experiences were similar to Y1. Since I knew at this point in the research design that RMMDI would guide my study, asking similar questions on identity, with a span of time in between the Y1 and STEM interviews, would give me opportunities to see any changes over time. The STEM interview protocol was shared with the PIs of larger transfer study research team for feedback prior to being finalized and added to the IRB for the study.

The STEM interviews were done with me as the sole interviewer. Participants in the STEM interviews received a $25 Amazon gift card. This interview provided an opportunity to further explore the identities the participants self-described as salient and connect them with their educational experiences in STEM, and overall transfer experience. The first section of this interview protocol included questions that helped to establish a deep understanding of the

participants' past and present educational experiences. This included asking participants about identities they hold to be important, and asking them to consider those identities in the context of the questions. Data sets from Y1 interviews as part of the larger transfer study provided information about each participant's educational timeline, asked about how they received information and guidance about transfer, and provided a context of the participants' overall educational experiences. The goal of the STEM interviews as part of my study was to hone in on participants' identities in the context of being in a STEM major and to get an understanding of participant's past and current experiences in STEM. IRB approval for my study included the approval to recruitment participants for my secondary interviews from the larger transfer study. IRB approval was obtained prior to data collection.

Instrumentation

In qualitative research, the researcher is the main instrumentation (Miles et al., 2014). Secondary instrumentation in qualitative research can be loosely structured (Miles et al., 2014). For this study, semi-structured interviews were the primary data collection instrumentation to allow the researcher to keep focus on connecting the study purpose and research questions to the interview. As a way to collect thick data descriptions, there were one to three interviews with the participants identified as eligible for my study. One-two of the interviews were a part of the larger transfer study (Y1 and Y2). The interview protocols that guided the Y1 and Y2 interviews were created as part of the larger statewide qualitative study of North Carolina Transfer students by the PIs of the study. The Y1 interview protocol was tested on participants from a pilot study in Spring 2021. Members of the research team, including myself, provided feedback on the initial interview protocol after the pilot study of eight interviews were complete. The PIs took the team feedback and incorporated slight modifications to an updated interview protocol. For my

study's additional STEM interviews, I used a semi-structured interview protocol that I wrote, and focused more deeply on identities and experiences specific to STEM majors.

During each interview I participated in (Y1, STEM, and Y2), I took jot interview notes. The jot notes from the interviews included observations, noting information about participants' mannerisms and demeanor. For the Y1 interviews, I included notes on experiences I wanted to further explore in my secondary STEM interview, and some of my personal reactions (Miles et al., 2014). Immediately after each interview, jot notes were reviewed, and typed up into an interview memo that included any additional thoughts after the interview was complete. Memo writing after interviews helped in capturing any initial thoughts and reflections from the interviews. Researchers from the larger transfer study also took jot notes and had them typed and saved as interview memos in a shared Dropbox folder. As described in more detail in the following section, as part of my data analysis; I reviewed all memo notes and they were an instrumental part of my analysis procedure.

Data Analysis Procedure Summary

As a researcher who was part of a research team for a larger transfer student study, I participated in data analysis for both the larger study and my specific research project. For my study, the data units analyzed included interview data that was collected from the larger transfer student study; however, my research questions, study purpose, and data analysis process are unique to my study. All interviews were audio recorded and transcribed over the Zoom meeting platform, followed by being professionally transcribed. The Zoom transcripts, and Zoom audio transcripts and the professionally transcribed transcripts were saved in Dropbox and available to reference. All members of the research group had access to all interview transcripts from the larger study.

A longitudinal approach was used to collect data from study participants between spring 2021 and spring 2023. Data collected came from a combination of a larger transfer student study and this STEM transfer study. Y1 interviews started in spring 2021 as part of the larger transfer study that focused on pre- and post-transfer student experiences in North Carolina. Y2 interviews were conducted through spring 2023. STEM transfer interviews were completed during fall 2022 and spring 2023. There were several benefits to using a longitudinal approach in data collection and analysis. The use of a longitudinal design allowed for the exploration of how attitudes changed between different timepoints within the transfer process (Allen et al., 2022). The exploration of shifts in attitudes towards STEM was able to be explored through the use of collecting multiple data sets with spans of time between interviews (Allen et al., 2022). The longitudinal approach also gave insight into how the participants made meaning of parts of their social identity in relation to contextual influences such as family and their physical environments.

Since this study collected data from the larger transfer study (Y1 and Y2) and the STEM interviews, it led to two data analysis approaches. The analysis approach for participant data from the Y1 and Y2 longitudinal transfer study was determined by the PIs in the larger transfer study. For the STEM interviews, I chose to use a whole-part-whole analysis, influenced by Vagle's (2018) post-intentional phenomenological approach. The start of identifying categories that lead to theme development came as the result of uniquely analyzing the different datasets (Y1/Y2, and STEM) and then combining all data on an Excel matrix. I cross-reviewed all data in the Excel matrix and returned to notations on interview memos from each interview.

Out of the larger transfer study in Y1, 14 women were identified as eligible participants for this study. The 14 eligible participants from Y1 were sent emails to participate in the STEM

study. Six of the 14 agreed to participate in the STEM interview. The third datasets were from the Y2 interviews. As part of the larger transfer study, all participants from Y1 were contacted to participate in Y2 interviews. Out of the 14 women eligible for this study, seven participated in Y2 interviews. Table 2 shows which interviews each participant participated in. Six women participated in all three interviews. The following section provides a detailed summary of the data analysis procedures for interview data from the larger transfer study and the STEM transfer interviews and how the analysis was synthesized together.

Table 2

Participant Interview Participation

Pseudonym	Y1 Interview	STEM Interview	Y2 Interview
Lilly	✓		
Maya	✓	✓	✓
Eve	✓		
Jill	✓	✓	✓
Emma	✓	✓	✓
Sara	✓	✓	✓
Jane	✓	✓	✓
Harper	✓		
Alice	✓		
Mia	✓		
Olivia	✓		
Charlotte	✓		
Beth	✓		✓

Pseudonym	Y1 Interview	STEM Interview	Y2 Interview
Liz	✓	✓	✓

Transfer Study Datasets

All interview transcripts from Y1 and Y2 were professionally transcribed and the transcriptions were uploaded to Dedoose, a platform used for analyzing qualitative data. Codes for Y1 and Y2 interviews were pre-identified by the PIs of the larger study and entered into Dedoose. As part of the research group of the larger transfer study, for Y1, I did the first round of coding for the interview datasets that were provided by the 14 women I identified that matched my STEM transfer study eligibility requirements. The first round of coding started by identifying larger sections that matched the pre-identified codes and they were highlighted and entered into Dedoose. Memo notes were also recorded into Dedoose. A memo name for STEM was created as a way for me to go back to all interview datasets that had specific data on STEM related experiences. A second round of coding on the datasets from Y1 was done by a secondary researcher on the larger transfer study project to ensure accuracy with the coding.

As a way to use the interview data from Y1 and Y2 and connect to my research questions, I downloaded the transcripts from the 14 women who were eligible for this study and used an inductive approach to data analysis. A phenomenological data analysis, often inductive, was started with reading the entirety of each individual interview transcripts (Tomaszewski et al., 2020). The inductive approach is used as a way to understand and describe the lived experiences of the study participants (Tomaszewski et al., 2020). Transcripts from Y1 and Y2 were re-read, line-by-line, with in vivo codes pulled that related to the research questions in this study. I also considered RMMDI framework as a way to guide the study and pulled direct quotes that I found

that discussed participant identity perception and contextual influences on identity. Additionally, interview memo notes from Y1 and Y2 were reviewed and I added notations to the documents as I re-read, line-by-line. Finally, data as it related to STEM, identities, significant influences, and transfer were entered into an Excel matrix that was used to organize all datasets from both the larger transfer study and this STEM transfer study.

STEM Transfer Datasets

In line with Vagle's (2018) post-intentional phenomenological approach, I used a whole-part-whole analysis method in combination with a statement analysis to identify significant statements. For the STEM interview datasets, I decided to follow the whole-part-whole data analysis because the approach allows the researcher to understand interview participant experiences, while also keeping the broader social context of the phenomenon in consideration (Vagle, 2018). The whole-part-whole process starts with a holistic reading of individual data sets, followed by line- by-line reading of each transcript, and reflection on follow-up considerations (Vagle, 2018). Written reflection on the data were done throughout analysis steps. The written recorded reflections were also a form of data that I referred to during the theme development.

The datasets from the STEM transfer interviews were professionally transcribed. Data analysis started during the first transcript review, where each interview was read while listening to the audio from the interviews. The act of listening to the interview, while reading the transcript, provided an opportunity to check the transcript for errors and also allowed me have greater insight into the data. Researcher reflections on the participants' tone of voice and other verbal cues were noted on memo notes that were used for each participant. The initial reading of transcripts in their entirety also gave the opportunity to become reacquainted with the data from

interviews. After reading interviews holistically and listening to the audio interview files, I started a line-by-line reading of each transcript. I also identified codes that aligned with the STEM interview protocol questions and coded large statements from the participant responses. Five large categories of codes (academic background, social identities, classroom experiences, support systems, and advice) were developed with sub-code categories. In total, there were 42 sub-codes. Lastly, I reread the transcripts and highlighted what I believed to be important statements. These statements were in vivo codes. In vivo codes on larger portions of data during the line-by-line readings were the first step of extracting the essence of what participants shared. In vivo coding uses words and phrases that come directly from participants, respecting their voice, and is a common type of analytical method to use in inductive research (Miles et al., 2014). In phenomenological research, the value in using direct quotes is significant to honor the participants' voice and experience. Researchers are then able to make meaning during the interpretation process, that can lead to theme development (Saldana, 2021). The act of intuitively identifying what I believed to be significant statements is an inductive approach to analysis.

The code list developed based off of the interview protocol questions was utilized as a way to organize data in an Excel matrix. Each interview dataset was coded manually, by highlighting phrases that aligned with the identified code, and using an inductive approach that focused on the research questions and the RMMDI framework. Coded phrases were entered into the Excel matrix. The in vivo codes and additional notes were entered into the Excel matrix.

Each participant had an interview memo that included notes and observations from the interviews. I continued to add notes to the interview memos during the data analysis. In addition to interview notes, during the data analysis I entered subheading for RQ1, RQ2, and RMMDI. This allowed me to write jot notes on my initial thoughts regarding how each dataset related to

my research questions and guiding framework. From there, I was able to review my memo notes and Excel matrix to identify emergent themes.

Putting it Together: Analysis and Organization of Multiple Datasets

As a phenomenological researcher, I did not want to be overly analytical in the data analysis because I believe there is value in staying as close to the shared participant experiences as possible. At the same time, I had 27 interview datasets that were analyzed between Y1, STEM, and Y2 interviews, and it was imperative to have an organizational system in place and procedures that would lead to thematic results. I chose to use a visual to help with data analysis organization. The matrix created in an Excel document was used as the central location to capture significant statements and in vivo codes that aligned with questions from the interview protocol. The Excel worksheet also functioned as a visual to compare data across participants. On the first tab of the Excel sheet, the horizontal columns were comprised of headings that came directly from interview questions from the STEM interview protocol and were related to my research questions. Those columns were populated with significant statements and in vivo codes from Y1, STEM, and Y2 interviews. Additionally, paraphrases from participant data were inputted. Additional columns were added for interview quotes that were found to be important, but not necessarily tied directly to the research questions, and a column for the researcher's additional thoughts and notes. Lastly, a column was added to capture data on the role of finances in transfer decisions. This came out of seeing a pattern emerge from interview data from Y1 and Y2 interviews.

In phenomenology, the development of central themes emerges from data analysis (Tomaszewski et al., 2020) and a shared essence within the phenomenon is described, interpreted, and reflected upon. As I moved towards theme development, I first reviewed the in

vivo codes and significant statements identified during the line-by-line transcript reading and inputted on the Excel sheet. Next, I categorized the statements into meaning units in a separate Word document. I referred to these broad categories as meaning units, and they were derived from what I identified as statements that had some commonality. That lead me to grouping these statements together. These meaning units evolved into creating categories. Putting a name to each category assisted with making the data analysis more meaningful and be a starting point in identifying themes amongst the data (Miles et al., 2014). The three major categories identified were (1) courses, credits, and classroom experiences by types of STEM degree, (2) impact of capital and support networks on transfer student success, and (3) finances and its place in outweighing perceived drawbacks of community college.

The categories from all analyzed data turned into the focal point for theme development. I considered the categories identified, referred to the Excel matrix for supporting quotes and paraphrases, and reflected on how the categories informed answers to my research questions. In this final stage, I centered in on commonalities among the data, and ultimately, identified shared essences that resulted in five themes that is described in chapter four. Once theme names were developed, the theme titles were added to the same Excel document in a second tab. I used this tab to organize supporting evidence to themes based on participant quotes and paraphrases.

Trustworthiness

There are some specific strategies available for qualitative researchers to employ in order to strengthen the trustworthiness of the data. Lincoln and Guba (1985) made the argument that reviewing data findings with the participants, referred to as member checks, is critical to the trustworthiness of a study. Through the act of sharing study findings with participants, the researcher may get insight into whether their previous knowledge of biases on the phenomenon

had influence on the data analysis (Lincoln & Guba, 1985). For this study, all transcripts were shared with participants via email for accuracy. The participants were told at the start of the interview that they would receive the transcripts, and had the option to review for accuracy. Participants were able to opt out of future email contact, or share their opinions and feedback. None of the study participants had further comments on their interview transcripts.

As a qualitative researcher, I want to strike a fair balance between what the participants said and how I describe and interpret their words (Williams & Morrow, 2009). As shown in the following chapter, direct quotes were used in the data analysis as a way to capture the participant voices (Williams & Morrow, 2009) and support the findings. The on-going process of reflexivity in qualitative research also can help with the researcher's ability to clearly differentiate what is said by the participant from what the researcher's interpretation is (William & Morrow, 2009). Note-taking after participant interviews, and regular journal writing were tactics I used to interrogate my own biases and reflect on what participants shared and how I described and interpreted their words.

I used peer reviews as another way to ensure trustworthiness in this study. As a member of a larger transfer research project, I had a research group to talk to about the interviews. I shared interview notes in a shared Dropbox file with the research team, and reviewed my findings with members of the research group.

Limitations

Being a part of a research team has many strengths, but is not without some limitations. I had less control over some aspects of my study. As a researcher interested in women of color in STEM, my sample size was limited to the number of women who participated in the larger transfer study. I also had less control of interviews during Y1 and Y2. Scheduling conflicts made

it not possible for me to participate in all interviews with participants who fit my study's eligibility requirements. The interview protocol for Y1 and Y2 did not include questions specific to women of color in STEM majors. I was able to ask questions specific to STEM student experiences in my follow up STEM interview. Although there are some challenges with incorporating data from a larger study, a positive was that the Y1 interviews allowed me to build rapport with the participants prior to the women participating in the STEM interview.

A second notable limitation for the study was that participants came from different STEM majors. In order to have a large enough sample size, the definition of STEM used for the study is broad. Participation in STEM tendencies vary among the academic disciplines (Hernandez-Gantes & Fletcher, 2013). For example, degrees in STEM that have seen an uptick in broader participation are more in science technologies, biological sciences, and mathematics (Hernandez-Gantes & Fletcher, 2013). Engineering, and computer science have seen negative gains (Hernandez-Gantes & Fletcher, 2013). A study that included only participants from PEMC majors, could potentially result in different findings.

Summary

Phenomenology is a qualitative research method that seeks to explain the essence of a phenomenon through the experiences shared by people who have directly lived the phenomenon. Phenomenological researchers can use a descriptive, interpretative, or reflective lifeworld approach. Vagle's (2018) post-intentional reflective lifeworld approach to phenomenology has a strong influence on this study's design and approach to data analysis procedures. In this study, I sought to understand a subset population from a larger transfer student study, to understand the lived experiences of women in color, pre- and post-transfer students, in a STEM major. I focused on community college transfer experiences and how social identities and identity development

can inform the transfer transitions. As a research member of a larger, two-year qualitative transfer student study, I was privileged to have access to a large sample and had support from the members of the research team; however, this also meant that I had to continuously be reflective on how my individual study is unique and be very thoughtful in my approach to exploring my own research inquires and data analysis process.

There is not a recipe to follow when conducting phenomenology data analysis. This chapter provided an overview that is specific to how my research study is designed, its connection to a larger transfer student qualitative study, and how the data were analyzed. It was important to me, as a phenomenological researcher, to stay true to capturing my participants' lived experiences through their voices, while also having a structure to keep my study focused on its purpose and research questions posed. The following chapter will provide detail on the three thematic findings that emerged after data analysis. In addition, I will describe the use of the RMMDI and how the model helped make meaning of the participants' meaning making capabilities around their identities and the effect of contextual influences.

CHAPTER FOUR: RESULTS AND FINDINGS

Introduction

The purpose of this study was to understand the community college pre- and post-transfer experiences of women of color in STEM degree majors. The study also explored how social identities, such as race, age, sexual orientation, parental status, first-generation student status, and ethnic and national orientation connect to higher education and specifically transfer processes. The reconceptualized model of multiple dimensions of identity (RMMDI) guided this study and provided a framework to draw connections between contextual influences, self-perceptions, and ultimately, how students make meaning of their dynamic identities (Abes et al., 2007). With a phenomenological approach, I looked for a common essence between participant experiences in their educational journeys that led to the development of five themes. In this chapter, I provide participant summaries and share theme development. The exploration of how the participants make meaning of their social identities in the context of post-secondary education and transfer decisions, through the use of RMMDI as a guide, is also embedded within each theme in this chapter.

Research Questions

The study was guided by two research questions. The research questions were considered throughout the entire data analysis process. Each research question was entered on the interview memos from the six participants who participated in the STEM interviews. Research notes were entered and cross referenced among the participants' memos at the time of developing categories that evolved into common themes. The data analysis Excel matrix was also used to capture data from all 14 participants who provided interview data sets from Y1 (14 participants), Y2 (7 participants), and STEM (6 participants).

RQ1: How do pre- and post-transfer women of color in STEM majors experience the transition into a university from community college?

RQ2: How do social identities inform STEM-related experiences for women of color in STEM majors?

Participant Summary

Participants in the study all identify as women of color in a STEM major, but they have varying demographic differences between racial identity, STEM major type, first-generation student status, and other self-reported salient identities. Table 3 provides a summary of the participants' demographic information. The "other identities" column was populated from both the self-reported identities the women provided on their demographic intake form that was completed prior to Y1 interviews, and identities that were shared as significant during the interviews. The intersections of identities impacted the participant experiences. The table offers a visual representation of the multiple identities each woman holds. Throughout the chapter, experiences between social identities, the intersection of identities, and how self-perceptions of identities connects to educational choices will be discussed.

Table 3

Participant Demographic Summary

Pseudonym	Racial ID	Pre-/Post-transfer	Major	First-generation	Other identities
Lilly	Hispanic/Latinx	Pre-transfer	Information Systems Security	Yes	Mother, Costa Rician
Maya	Asian	Post-transfer	Statistics	No	Chinese International Student
Eve	Indian American	Post-transfer	Polymer and Color Chemistry	No	2nd Generation Immigrant,

Pseudonym	Racial ID	Pre-/Post-transfer	Major	First-generation	Other identities
					Indian-American, Trilingual
Jill	Hispanic/Latinx/white	Post-transfer	Psychology	Yes	Mental Health Disability, Bisexual
Emma	African American/Black	Post-transfer	Psychology	Yes	
Sara	Hispanic/Latinx	Post-transfer	Aviation and Business Management	No	2nd Generation Immigrant, Honduran
Jane	Hispanic/Latinx	Pre-transfer	Biology	Yes	Spanish First Language, 1st Generation Immigrant, Honduran
Harper	Native American/ Indigenous/White	Post-transfer	Exercise Physiology	No	
Alice	African American/Black/white	Pre-transfer	Science and Vet Tech	No	Mother, Military Spouse
Mia	African American/Black	Post-transfer	Construction Management	Yes	Mother, Bisexual
Olivia	Asian/Pacific Islander	Post-transfer	Electrical Engineering	Yes	Vietnamese International Student, LGBTQ+
Charlotte	African American/Black	Pre-transfer	Computer Science	Yes	

Pseudonym	Racial ID	Pre-/Post-transfer	Major	First-generation	Other identities
Beth	African American/Black, Biracial/Multiracial	Post-transfer	Health Sciences	Yes	Mother
Liz	African American/Black, Biracial/Multiracial	Pre-Transfer	Associate in Science	Yes	Bisexual

Participant Profiles: Y1

Data were collected and analyzed from 14 women in STEM majors who participated in the Y1 interviews from the larger transfer study. The following participant profiles provide a summary of eight women who participated in Y1 interviews. These participants only provided one interview in Y1 (with the exception of Beth who participated in Y1 and Y2 only), but it is valuable to understand their background and experiences as transfer women of color in STEM majors. With only one interview to analyze, this group of participants did not allow for a deeper understanding of their social identity meaning-making over time, but they did share extensive information about their educational journey as a transfer student.

Lilly

Lilly is an adult pre-transfer learner who is pursuing an AAS in Information Systems Security degree with bachelor's degree aspirations. Lilly works full-time for a national company and is the owner of a cyber security consulting company. She is a Latina woman, second-generation immigrant, and first-generation college student. She is married and has adult children. Lilly made decisions on her community college based on professional networks in which she participates. Lilly's plans to transfer to a private online university in a cyber security bachelor's program.

Eve

Eve is an Indian-American, second generation immigrant, post-transfer student. Eve is a polymer and color chemistry major. Eve applied directly into a bachelor's degree from high school, but after not getting into her first-choice school she decided to pursue an AS degree at community college with bachelor's degree aspirations. Eve has received financial and emotional support from her parents during her educational journey.

Harper

Harper is a post-transfer student in an exercise physiology major. She identifies as being Native American and white. Harper's entry into community college was through early college. Finances played a significant role in Harper's educational choices and that led her to enlist in the military. Harper has received post-transfer institutional knowledge from her mother, who had previously attended the same institution.

Alice

Alice started her post-secondary journey in a bachelor's degree, but then stopped-out and returned to a community college. At the time of the Y1 interview, Alice was a pre-transfer science and veterinarian technology student. She identifies as being an African American and white woman. She is also a mother and has a husband is in the military.

Mia

Mia is an adult learner, post-transfer student. She left her community college with her Associate of Arts (AA) degree. Mia always had transfer aspirations. At the time of the Y1 interview, she was in a construction management major. She identifies as being bisexual. She also is a mother. Mia's parents were associate degree earners. Mia's parents are proud of both her, and her sister, for being the firsts in their family to pursue bachelor's degrees.

Olivia

Olivia is an international student who started her post-secondary education at a community college. At the time of the Y1 interview, Olivia was a post-transfer student in an electrical engineering baccalaureate degree program. Her LGBTQ+ identity is very salient. She decided on her post-transfer institution, in part, because she felt there was a lot of support for LGBTQ+ students.

Charlotte

Charlotte is a pre-transfer adult student in computer science. Charlotte was in her last semester at community college at the time of the Y1 interview. She is an African American woman and a first-generation college student. Charlotte holds an on-campus job that gives her the opportunity to encourage other young women of color to pursue STEM.

Beth

Beth was an exception and participated in Y1 and Y2 interviews. Beth had a long history of transfer swirling patterns. She had previously earned an AA degree. At the time of Y1, Beth was duel enrolled in a community college and a bachelor's degree. By Y2, Beth was in an online health science bachelor's degree program. Beth identifies as being an African American woman. She is also a mother.

Participant Profiles: Y1, STEM, Y2

Six women participated in all three interviews. Maya, Jill, Emma, Sara, Jane, and Liz participated in the STEM transfer study interview in addition to being participants in the Y1 and Y2 interviews from the larger transfer study. The multiple interviews of Maya, Jill, Emma, Sara, Jane, and Liz gave me the opportunity to compare contextual influences over a span of time and explore if and how context influenced their perceptions and making meaning of multiple social

identities (Abes et al., 2007) during different phases of their transfer experiences. Participants shared their educational journeys from K-12 through where they currently were in the transfer process. The analysis of interviews from multiple points in time for these six participants allowed me to explore the saliency and self-perceptions of identities and look at contextual influences that impacted meaning making capabilities around identity and decision making as it related to educational choices. As participants in a longitudinal study, each woman shared details of her educational path that gave insight to how context changed over time. This exemplified the fluid nature of meaning-making complexities over the stretch of time between interviews.

As there was a span of time between each interview, over a year and a half between Y1 and Y2 in some cases, there was an opportunity to truly use the RMMDI to get an idea of how self-perceptions of identity and self-meaning making capabilities evolve over time. RMMDI as a framework also was conducive to the exploration of identity saliency, and identification of which identities were closer to their core identities for the participants. Data were still used from study participants who only participated in Y1, or Y1 and Y2 interviews, but the data from the six women who also participated in the STEM interview will be referred to more as they provided rich, in-depth narratives. The following section provides a participant profile for the six woman who participated in all three interviews. Each summary starts with a quote that gives the reader a deeper connection to the participant and to understand what was important to her. The participant summaries put emphasis on the role of multiple identities, the intersection of identities, and gives an introduction of experiences and changes over time for each woman.

Maya

> I feel the pressure about statistics. I just really feel like I do not belong here. It's like I can do better in any other places, but when it comes to statistics I can never be the student

that the professor is like, ‘oh yeah, she’s a very great student.’ I just can’t see that at all. I’m just always struggling.

Maya is a Chinese international student who came to study in the United States for high school and continued through community college. She is now in her bachelor’s degree program and is pursuing a statistics major with a minor in economics. She is an only child, coming from a self-described middle-class background, and receives financial support for education from her parents. Prior to starting at community college, Maya had bachelor’s degree intentions and had already identified her bachelor’s institution, but after comparing the cost between the community college and university, she decided to enter post-secondary education through community college. This was during the COVID-19 pandemic which resulted in her community college courses being taught in an online asynchronous format. Maya transferred into her bachelor’s program before earning an associate degree.

Becoming a statistics major was not entirely Maya’s own decision. Maya had several contextual influences that included being an only child and an international student, that were in the backdrop of her educational decision making. External pressures from her parents, in particular her father, pushed Maya into statistics. Maya described deciding on statistics as a “middle ground in STEM” that will position her to pursue a different major within STEM for graduate studies. Throughout her time as a statistics major, her meaning making capabilities became increasingly more complex. She showed this in how she described deliberate academic choices and connections to herself and her future. Maya was in her final semester of her bachelor’s degree during the Y2 interview and was applying to graduate programs in statistics. Although Maya said, “I just really feel like I do not belong here” referring to being in statistics, she still plans to pursue a higher degree in the field. Maya’s father remains a strong influence on

her educational decision making, even as she was preparing to graduate and select a graduate school program, her father continued sharing his opinion that having a "very strong background" in statistics will allow her to move into other disciplines more easily if she decides in the future.

Jill

> Pretty much, it honestly was a personal interaction with mental health services at [post-transfer institution] and just private practices that I'd interacted due to my own mental health issues. It was something always appealed to me and almost like, I need these services currently, but these are kind of the services that I would love to provide for others. So, it was really my personal struggles with mental health that led me down to the road where I decided I wanted to pursue psychology to become a therapist at some point.

Jill is a psychology major who was admitted directly into a bachelor's degree program from high school but decided to attend community college for her first two years in post-secondary education. Jill started as a fine arts major at community college, but during her last semester she changed her major to psychology. She was able to graduate from community college with an AA and Associate in Fine Arts degrees. Jill has a brother and parents who she lives with. She is financially responsible for her education. Jill's self-described racial identity is Hispanic, but since her nuclear family moved away from extended family, Jill noted that she does not have "as many ties with my Hispanic roots."

Jill made the connection of several of her identities having an impact on educational choices she has made, particularly in regards to her identity as a bisexual woman and her identity with mental health disabilities. Jill described how her mental health disability has impacted her education, "I struggle with persistent depression and an eating disorder that has prevented me from maintaining complete full-time with school at times." While she described how her

disability had been a barrier, she also noted that she found connections with others who share similar disability identities. Jill was not always familiar with disability services available to her and her timeline to degree competition was negatively impacted. Once Jill became aware of services on campus, she had additional meetings with her academic advisor and the disability resource office on campus that helped her with understanding her degree progression plan. Jill's mental health disability had a direct correlation with her major choice. Her decision to change her major from fine arts into psychology was directly connected to Jill's disability identity.

The act of entering higher education itself allowed Jill to explore her identities in a different way. The post-secondary educational environment as a physical context exposed Jill to an environment that helped her meet more people with shared identities in comparison to her high school experiences. Jill described where she went to high school as a more conservative environment and describing college she noted, "I did find that college was helpful with meeting people who align more with those values." She continued by saying, "college has definitely provided more exposure to people of different sexual and gender identities." As Jill spoke about her LGBTQ+ identity, she spoke about the comfort she felt in both the university environment and in her psychology major.

> I tend to befriend people whom are either allies or on that spectrum. Um, so that's always been like, it's been very comforting, um, coming into university and it's like, it's a very progressive and very accepting, um, environment, at least in the major that I've selected.

It was evident that over the course of the Y1, STEM, and Y2 interviews that Jill developed a greater capacity for making meaning with her identities. Even after Jill entered into the psychology major, there were times where she questioned her choices and doubted her capabilities. In the Y2 interview, Jill described her Junior year as a "mid-college crisis." She had

moments of thinking about leaving her psychology major and found herself in an indecisive place. As Jill reflected on that time, she, in hindsight, can see that she was experiencing a "bad flare up" that was specific to her disability. After receiving treatment, her confidence flourished and she found her personal and academic life become more enjoyable. She also started to become more confident with her graduate school aspirations and established her long-term goal to become a therapist.

Emma

> I would say in certain careers, being a woman, it can be difficult but in psychology and studying in a clinical area for women is not as much of an issue because, you know, society see women as being very empathetic and stuff and having compassion for others.

Emma attended an early college high school (ECHS) where she was able to simultaneously earn her AA degree through community college. Emma did not enter community college with bachelor's degree aspirations; she weighed her options between going directly into the workforce or pursuing a bachelor's degree and decided on the latter. During her last year in community college, Emma made the decision to pursue a psychology major. As an ECHS student, Emma graduated at 17-years-old and entered into her bachelor's degree as a junior at 18-years-old. Emma describes herself as a first-generation college student, as her mother did attend college, but passed away when she was younger. Emma applied to three universities for her bachelor's degree and decided to attend a small private school.

The contextual influence of the physical environment Emma grew up in had a lasting impact on her choosing psychology as her major and future career aspirations. Emma demonstrates complexity in her meaning making of her identities through her descriptions of contextual influences such as losing her mother at a young age and subsequently being raised by

a grandparent, her first-generation college status, and the environment she is from. Emma described the area she is from as having drug and gang violence and that led her to consider psychology as a major.

> So, my focus in the psychology area, I would like to focus on substance abuse and if not just that area focus on correctional working as a correctional counselor. So, growing up in the environment that I grew up in, there was a lot of drugs and stuff and gang violence and a lot of young students turned to the streets because they didn't have the right guidance or they dealt with their families being, you know, addicted to something and they couldn't control it.

Emma articulated how her extended family challenges her future career choices based on her being an African American woman. When Emma has shared to her family that she takes "mental health very serious" and "one day I want to be a counselor" her family countered her by asking questions like "you think that's a good profession for you, being African American or this and that?" As a first-generation college student, Emma pulled from varying contextual influences when making educational decisions. Emma had hesitation of being "one of the few" that choose to enter post-secondary education instead of going directly into the work force in her family. Emma has reflected on her family's viewpoints and has made her own meaning between her identity intersections and educational choices. Emma shared that she does not "really see demographics as my whole identity. I go more so personality and things of that nature." The course work as part of the psychology curriculum has included a focus on self-awareness that has shown to be influential in how Emma makes educational decisions and sees her identities and how they impact choices.

Sara

> I feel like all these experiences of, or my identity is could be, is not quite unique but it's just like, it's not too common. You don't really see like a lot of like women there as a pilot. It's a male dominated field. So, like I am glad to be able to be in it…to try to change the views about, about not being a dominant male dominant industry.

Sara attended an ECHS and obtained an AA degree. Sara describes herself as a Hispanic woman who identifies language as an important identity that molded educational experiences since a young age. She is a second-generation immigrant whose parents' first language is Spanish. Sara identifies her first language as English and that was not something educators in her elementary school understood. Sara selected an ECHS as her pathway into post-secondary education because she saw it as an opportunity to take college classes at no cost and then be able to transfer into a bachelor's degree. Sara had career aspirations to be a pilot and she transferred into her bachelor's degree program as an aviation and business management major. Sara ended up withdrawing from her STEM program when she dropped her aviation major and was only in the business management major at the time of the Y2 interview. Sara describes her socioeconomic status as middle class and she does receive some financial support from her parents.

Sara's identity around language, gender, and development of a science identity were significant in her educational journey into an aviation bachelor's degree program. Sara's meaning making capability around her identity as a second-generation immigrant and language started in elementary school and continued to have a strong impact through her present-day experiences as a post-transfer student. Sara's parents' first language is Spanish, but Sara was comfortable with both English and Spanish from a young age. Educators assumed that she spoke

Spanish primarily based on her family and because of that, in elementary school, Sara was taken out of her classes to attend English as a Second Language (ESL) courses. Sara felt this was unnecessary and that it ultimately had a negative impact on her grades. The time she was in ESL classes took her away from English grammar lessons. This continued through sixth grade for Sara. Sara has developed a meaning making capability around the connection between her American and Hispanic heritages despite finding that educators have not always embraced her bilingual identities as a strength.

Sara was an aviation major during the Y1 and STEM interviews. At that time, Sara found herself to be the only woman and only Hispanic person in her cohort. At first, Sara had feelings of apprehension of not feeling like she would fit in. Although Sara was in a context that had barriers to a sense of belonging as the only woman, Sara recognized her uniqueness and what her presence meant for the aviation program. By being a woman in her major, Sara believed that she, alone, could challenge the social view that aviation is an industry for men. As the only woman in her major, Sara developed friendships with women in other majors. She did not have other women support systems within her aviation major, but had developed relationships with others on campus in different majors through participating in university clubs.

As a second-generation immigrant, Sara's language identity was identified as important in each interview. During the Y2 interview, Sara talked about how she ended up leaving the aviation major, a major that she had so much passion for. Sara was strongly encouraged to pursue another path from instructors of the aviation program, with the claim that her English language proficiency was a barrier to her within the degree. Sara discussed her initial feelings of acceptance, but also shared that over time, and through speaking to people in her support network, that what happened to her was inappropriate. Her hopes of returning to an aviation

program are still there. Although she changed her major and was content, she also spoke about the possibility of transferring to another university after her experience within the aviation program.

Jane

> I've always wanted to go to college to be somebody, to actually, yes, be the first one in my family to go to college, to graduate, to make my parents proud, to be proud of myself that I actually did something, and mostly just wanted to be somebody important.

Jane is a first-generation college student who moved from Honduras to Florida with her parents when she was two years old. In Florida, Jane grew up in a Latinx community, but since moving to North Carolina two years before the Y1 interview, she finds herself in spaces where she is the only Latinx person. Jane was admitted into bachelor's programs after high school, but due to financial concerns she decided to pursue an associate degree first. She was a pre-transfer student during Y1, STEM, and Y2 interviews. Prior to starting in a community college, Jane attended a veterinary assistant magnet high school that propelled her interest in having veterinarian career aspirations and to decide on a biology major. Jane describes her socioeconomic status as middle class and she receives financial, emotional, and motivational support from her parents. As first-generation college students, Jane and her brother often receive stories from their parents about how they came to the United States for greater opportunities that education can provide.

Jane described her faith, being a first-generation college student, and Hispanic ethnicity as salient identities. The saliency of her ethnic identity became more prominent for her after she moved to North Carolina. She went from being around people with shared identities to finding herself as the only Hispanic girl in her classes and local community. Jane described not feeling

overt racism towards herself and her family, but did describe microaggressions that included being stared at. Throughout her interviews, Jane used the language Hispanic while describing her background.

As a first-generation college student, Jane's parents have instilled feeling of being proud to be the first in the family to attend college, and work towards completing a bachelor's degree. Jane has extended family members who earned bachelor and professional degrees, but they are not in the United States and had a different educational experience from Jane's. Jane's identity as a first-generation college student is present in different decision makings around transfer. This part of her identity provides Jane with moments of feeling proud, while at other times it can be a cause of pressure.

> It's just sometimes it could be a lot of pressure when you're the first one out of the house going to college because you don't want to let your family members down or anything.

While Jane feels the need to complete her bachelor's degree and aspires to go to veterinary school, she also has conflicting feelings about transferring due to her financial context. During the Y2 interview she mentioned the possibility of a "gap year" before transferring into a baccalaureate degree program. This idea of stopping-out, meaning not completing her plan of study within a traditional timeframe, (Hoyt & Winn, 2004) conflicts with her previous comments about wanting to complete her bachelor's degree quickly. This indicates how much finances attribute to her transfer decision making.

Liz

> I'm usually the only person of color in the room that's a woman, if not the only person of color. So, I feel like some days I feel eyes are on me when it's like, okay, can she carry her weight around here? Can she keep up with the rest of us?

At the time of the Y1 interview, Liz left her high school due to issues with the shift to online learning as a result of the Covid-19 pandemic and was in a program at community college to complete her high school diploma. Liz since has earned her high school diploma and is a community college student in an AS degree. Liz has transfer aspirations after she receives her AS degree. Liz is a bi-racial woman who spent much of her childhood growing up with her white mother and attended predominately white schools. She has a sister who is much younger that she helps take care of and she works part time at a coffee shop. Liz is a first-generation college student and that status plays a large impact on her educational drive, but can also be the source of stress between her and her family, as she feels they do not always understand what it takes for her to achieve her educational dreams.

There were 10 months between Liz's participation Y1 and Y2 interviews, followed by the STEM interview approximately one month later. Liz experienced several changes in her studies between the Y1 and Y2 interviews and her descriptions of herself as a STEM student and first-generation student evolved between Y1 and Y2. During Liz's first interview she was in an adult high school program at community college to complete her high school diploma and enrolled in community college courses. The major she planned to pursue was an AS in Science Secondary Education in Biology. At the time of the Y2 interview, Liz had received her high school diploma and continued in community college in the AS degree; however, her interest shifted away from teaching and biology and moved towards natural sciences and research.

Liz grew up with predominately white people and found herself in spaces where she felt like she was one of a few women of color. As she considers her post-transfer options, Liz described her interest in historically Black colleges and universities (HBCUs) as a way to connect to her African American identity.

> Growing up in this county and not seeing many people like me, I don't know. I kind of want to immerse myself more in that other side of culture I have. I didn't really do much with my father who was the main pusher for that culture when I was younger. So I kind of grew up not really knowing what to do with this identity. You know what I mean? I felt like this false, I don't know, imposter syndrome. I feel like I didn't fit what I was doing and who I was. So I'm definitely wanting to look more into HBCUs and getting myself involved in more cultural things for me.

While she explores HBCU options and expressed in Y2 that was her first choice in type of school, during her STEM interview she shared some hesitation. She explained having feelings of being "out of place" when she toured one HBCU. She described it as, "It wasn't uncomfortable, but it was unfamiliar in a sense. I'm sure I would love it if I was there, but it was definitely unfamiliar to me."

Complexity and Capability of Identity Meaning-Meaning

As a qualitative study, it was important to understand the lived experiences of the participants through their voices. Through understanding the lived experiences of each as an individual, commonalities were explored that lead to a shared essence around transfer experiences for women of color in STEM. Findings led to the development of five themes, while at the same time each dataset was individual and told unique stories. The use of interviews provided a "developmental narrative" of participants' understanding of her gender, race, and

other self-identified social identities and the intersection with educational choices (Abes & Kasch, 2007, p. 619). This provided a depth to exploring the transfer experiences of women of color in STEM.

Overarching Themes

As the participant summaries showed, each woman had her own stories, identities, and context that had influence on transfer decisions and experiences. Even with the uniqueness of the individuals, there were shared commonalties between them. Those similarities led to the emergence of five themes during data analysis. The thematic findings indicate a shared essence between transfer experiences among the participants. This section will review each theme. As a researcher, I followed a post-intentional phenomenological design that encourages the use of participant voice as to support theme development. Participant examples and quotes are weaved throughout each theme description to provide evidence of the theme and honor the participant voices and experiences.

Table 4

Summary of Themes and Subthemes

Theme	Subtheme	Description
The internalization of community college stigma	• Stigma as shame • Smart enough • Creating your own path: Stigma and first-generation college students	Prioritizing finance and long-term goals outweighed perceived drawbacks of attending community that included feeling of "missing out" and stigma.
Blindsided: Post-transfer rigor	• STEM course rigor • STEM course challenges in community college	Students experienced a shock to the system transitioning from courses in community college to a STEM bachelor's degree.

Theme	Subtheme	Description
	• Isolation within STEM classrooms	
The loss of personal connection post-transfer	• Experiencing and anticipating a new environment • Making post-transfer connections	The community college atmosphere is often small spaces that allow for personal interaction with peers and instructors. Post-transfer students experience a loss of connection, while also forming new bonds.
Feeling behind and other perceived roadblocks for STEM transfer students	• Credit mobility concerns • Not sufficiently prepared	Feelings of not being academically prepared for post-transfer courses in STEM subjects and loss of credit.
Can't do it alone: Leaning on support networks for success	• Educator support • Family support • Support structures within community college	The different types of support networks, both internal and external from academics, and the role they play in student educational, motivation, financial, and emotional supports.

The Internalization of Community College Stigma

Community college is a common entry point into post-secondary education. Nearly half of the bachelor's degree earners have attended a community college, yet it is often perceived as less than or a non-traditional approach to higher education. The reality is, the nontraditional is the traditional, meaning that starting at a community is very common and the narrative that it is not just does not hold truth. The women in this study each talked about why they choose to start at a community college. For several of the women, starting at a community college was not a first choice, but for varying reasons they felt it was the best choice. For others, they had long-term academic goals, so entering through community college was the best choice for them financially. None of the participants expressed feelings of regret with their community college

decision and each had very positive experiences at their community colleges, but yet there was an undertone of feelings of stigmatization around the choice to attend a community college over directly entering a bachelor's degree program. For some women, notably Jill, the feelings of stigma around not going directly into a bachelor's degree were overt. For other women, they described internalized stigma based on the projections of others in their life. The degree of feelings of stigma varied, but there was a commonality of internalized feelings of stigma. The following sections will explore stigma as shame, the idea of being "smart enough," and first-generation students creating their own path, even in times of conflict from within their own supports.

Stigma as Shame

There are several positive benefits to starting in community college, such as the financial savings, small classroom environments, and being close to home. At the same time, for many there are feelings of shame or not feeling smart enough to the choice of community college. Jill is responsible for funding her college education and the financial consideration played a major impact on her decision. Although she made her own choice to start at a community college, she described the decision as a "compromise" and "settling." Jill received high grades in high school and graduated within the top 20 of her class. She describes how she felt with her initial decision to go to community college.

> But for me it was when I graduated high school, the grades that I had, I was kind of expected to go to really nice university and do really well in that regard, so there was a, definitely, a period where I was a little bit down on myself and a little bit ashamed of the decision that I made even though it was practical.

In each of Jill's interviews, the feelings of stigma with being a community college student were addressed. At the time of the Y2 interview, Jill was a senior in her bachelor's degree. The stigma feelings she had have lessened, and she sees that she is performing as well as other students who entered as first-year students. As a high achieving student in high school, Jill felt that making the choice to go to community college, even though she was accepted directly into bachelor's degree programs, said something negative about her academic ability. As she now is starting to plan for applying for graduate programs, she was more confident in her academic choices.

Similar to Jill, there were other participants who applied and were admitted into bachelor's degree programs directly from high school, but made the decision to start at community college. For Jane, her salient identities, close to her identity core included being a first-generation student and first-generation immigrant. The intersection between those identities surfaced when it came to preparing her university applications. Although Jane was accepted into four-year universities directly out of high school, while she prepared her transfer applications from community college into a bachelor's degree program, she faced doubt. She noted that she found herself struggling with writing college essays and since her parents have not had their own experiences with college essays and they prominently speak Spanish, Jane sought out support from a trusted friend who proofreads and provides honest feedback.

> I have a friend who I go to and he proofreads my essays. What I love about him is he's super honest. Because he's amazing in English so I always tend to go to him. Mostly him because my parents don't speak English that well, so I can't go to them.

Closely connected to stigma as shame is the feeling of being "smart enough" in both STEM and being post-transfer having a community college experience first. The next subtopic will unpack the essence of being smart enough.

Smart Enough

The perception that starting at a community college equates to not being smart enough for a bachelor's degree is a common stigma about community college and this misnomer surfaced in Olivia's interview. Olivia, an international post-transfer electrical engineering student, did not have the self-perception that she was not "smart enough" to go directly into a bachelor's degree program, but encountered a classmate who projected their ideas of community college stigma. Olivia was confronted by a peer who felt that people entered higher education through community college because they were not academically ready for a four-year university. In response to that, Olivia said, "so, it's weird he thought usually people going into community college, it's just because they're not smart enough to go to university as freshman. So, I guess that's a really misleading thought."

Being in STEM can equate to a perceived high level of intelligence. For women, the messaging they receive from a young age can impact their sense of belonging within STEM and can provide a sense of validation within STEM, or have them question their intellect ability to be in STEM. An example was with Sara. While in community college Sara aspired to be a pilot, and upon transfer she was accepted and enrolled in an aviation program. As a post-transfer student, when she reflected on entering into aviation, she had some reluctance because of a fear of her science ability that was connected to a community college science class.

> For me, I feel like it, like when it comes to the science part of like the chemistry, I was reluctant to go a little bit to aviation because I was just afraid. I was like, oh no, I know I'm not good at science like most of the times.

The idea of intelligence within STEM education and the role of mentors and support systems is very impactful. Being a woman and holding other marginalized identities contributes to internalized stigma and can lead to women questioning their STEM identity and feeling "smart enough." The layering of first-generation identity also can have an influence on feelings of internalized stigma. Eight of the participants identified as being a first-generation college student. For these women, that identity was close o the core of their self-perceptions of identity saliency when discussing educational choices. Their experiences within their close support networks at times led to internal tensions.

Creating your Own Path: Stigma and First-Generation College Students

The intersections of social identities in addition to a transfer student identity had influence on self-perceptions of being a community college student. For the women who were first-generation college students, they experienced a stigma for making different educational choices from family members. In most cases, family expressed proudness of their student, but a tension still was present between the student and family not always understanding their post-secondary educational choices. Emma internalized feelings of stigma with her family when it came to her educational choices after high school. As an African American woman who entered community college via being an early college high school student (ECHS), the contextual influences of the environment she grew up in, and her family's opinions were something she struggled with. Emma did not enter her associate degree program with bachelor's degree aspirations because of this. In addition to feeling different from her family, she also felt like a

different type of post-transfer student. Emma felt internal stigma, as she was not the traditional transfer student as an ECHS, but was also not quite a first-year student as she entered with prior experience in college.

Other participants shared similar experiences to Emma. Over the three interviews, Liz discussed her thoughts on being a first-generation college student and what that means to her and how it impacts her motivation and academic choices. As a first-generation college student, Liz felt like her family was “rooting” for her, but at the same time she shared experiences when she received push back from her family for her deciding to pursue a different direction then they did. Liz explained how her grandparents feel that her energy should be more focused on starting a family or owning a home. Liz also shared that, at times, her family does not understand the time commitment that goes into being a college student with other responsibilities and they sometimes view her as isolating herself when Liz is actually just tired from her day. Liz explains this in her own words.

> I'm like, look, there's a lot that goes into being a college student, and no one else in my family has done it before. So, they're all kind of watching and trying to figure out what I'm doing and why I'm not doing what they did at my age. But I don't know. It's comparing apples and oranges and I'm trying to explain that, but it's not going well.

For the post-transfer participants, the large space between entering community college and transfer gave them an opportunity to reflect on decision-making from a place of hindsight. Although there were still feelings of internalized stigma and discussions around drawbacks to attending community college, overwhelming, everyone was ultimately satisfied with their educational choice. Internalized stigma was present, but the benefits of attending community

college outweighed perceived drawbacks, including internalized feelings of stigma and stigma projected from contextual influences (family and peers) about educational choices.

Blindsided: Post-Transfer Rigor

Science courses have a reputation of being difficult and rigorous and depending on the subject area, these courses can be taken by more men than women. There are nuanced differences of perceived rigor within STEM courses depending on the discipline, but the essence of rigor within STEM overall is present. This theme explores the at times unexpected post-transfer course rigor, the pre-transfer student experiences with rigorous courses while at community college and how that impacts transfer timeline, and the connection of social identities within challenging STEM classes.

STEM Course Rigor

The perceptions of course difficulty levels in STEM classes came through the participant narratives. There was a general sense that courses taken at community college were less challenging compared to four-year colleges/universities. This sentiment was present in a majority of the interviews with post-transfer students. For the post-transfer PEMC participants (Maya, Eve, Sara, Mia, and Olivia), they found themselves having to take rigorous science courses after transferring into their baccalaureate institution. At times, there was an overlap between disappointment in credit mobility and having to unexpectedly take a course post-transfer. This happened to Eve, a polymer and color chemistry major. During her first year in her bachelor's degree she had to take organic chemistry and physics, both demanding classes that were taught in large lecture halls. Not only was the coursework challenging, but she also found the classroom environment to be a very different type of classroom experience compared to her small classes at community college that impacted challenges in the class.

Course rigor for post-transfer students was also connected to feeling underprepared by transferred prerequisite course work. Maya, a statistics major, was able to transfer a pre-requisite course requirement for her major; however, the course served as a pre-requisite for a higher-level statistics class and Maya felt the community college course did not adequately prepare her. Ultimately, Maya felt the curriculum between the course at her community college differed from the course equivalent at her four-year institution. To some extent, this led to concerns for Maya post-transfer. Maya described how she experienced the rigor of course work in her first-year post-transfer.

> I would say it's about loading all the major courses in the junior and senior year. It's pretty hard and you don't really have the time to try, try out some classes in the freshman and sophomore year. So, you are pretty much doing a statistics major the last two years of your school compared to other people. Maybe they can spread it out to four years. There's less pressure.

STEM Course Challenges in Community College

To combat being blindsided by challenging courses post-transfer, some participants thought strategically about at what institution they would take certain STEM courses. Harper, Jane, Alice, and Liz talked about their experience with science courses at community college and the connection to transfer. Pre-transfer participants Alice and Jane both discussed specific STEM courses that they found challenging that resulted in a negative impact on their transfer timeline. Jane, a pre-transfer biology student, experienced transfer timeline setbacks due to retaking mathematics and anatomy courses that were part of her major. Jane's community college advisor shared concerns about her course load, but Jane felt strong about taking as many science courses as possible before transferring. During her Y2 interview, Jane shared that she received advice

from a peer about taking mathematics courses while in community college. Jane shared what she was told and the impact it had on her course decision making.

> I didn't want to take the hard classes in the university, but it looks like I'm going to have to still take a summer semester to take calculus because I don't want to take it in a four-year university because I have a friend, they told me that its harder, math is hard over there. You don't have the same quality time with your professor since here in [institution], it's smaller classes. Over there is bigger classes. So, they always advise me to take the harder classes here in [institution]. Take as much classes as you can here and then you can take the ones that you need in a university

Alice, a pre-transfer AS student, expressed disappointment and frustration when she decided to drop a mathematics and science course. Alice felt that her community college did not offer sufficient resources to help and received little guidance from the course instructors. Alice described the toll that making the decision to drop the courses had on her emotionally and on her transfer timeline.

> I'd kind of had a little bit of a breakdown because I was just so upset with myself that I didn't understand and that I wasn't doing good, because I love math and I wanted to be a math teacher, and so it was just embarrassing for me. And so I had to drop those two courses, and that really put a damper on my timeline because now I'm having to go in the summer to take those two courses again after this semester. And so that kind of hurt a little bit. But other than that, I'm back and I'm trying again.

STEM rigor is evident, and the additional layer of being someone who holds identities that are underrepresented within STEM creates a deeper complexity. This is highlighted within

classroom settings. The following subtopic will provide more details on the impact of isolated identities within STEM courses.

Isolation within STEM Classrooms

Participants noted some of their identities as impactful on feelings of isolation within STEM classrooms. Gender identity connected with transfer and STEM identities surfaced in classroom experiences. Although present among all participants, the degree of saliency and their meaning-making capability was on a spectrum. Varying among major type, gender identity was either closer to, or further from, the core of identity self-perception importance in the context of educational experiences.

For some women, coursework was rigorous at first, but once the shock to the system settled, they felt very comfortable academically. Construction management major, Mia, was able to articulate her identities as they relate to classroom experiences. Mia's gender identity of being a woman, African American, bisexual, and a mother were very important to her. Mia's strong connections to her identities as a construction management major are evident.

> I'm in the construction management program. That's very male dominated. Very cis, hetero, male. White, male dominated field. And even in my classes, that's mainly what you see. And I don't think that I'm any less than any of them. They sit there looking confused all the time. And it's crazy how... And I don't think that, not saying that they probably already had this notion of what I am, but it's just really funny seeing me sitting there. And I know that I'm not what they're used to sitting there. And, so I hold those identities true. And I keep those identities everywhere I go.

Other participants also found that within their classrooms they felt judged as a woman for being in the space. This perceived judgment was evident with Lilly, a pre-transfer information

technology major. Lilly is an older non-traditional student who is a mother of five adult children. As someone who already is professionally in the information technology field, she spoke about experiences being a woman from both professional and student lenses.

> In the IT and security, and cybersecurity field, there's a lot of people that just have an expectation that you know a certain thing. And being a woman also, I hate that this is a real thing, but I have come up against a lot of, especially my work as well, just people that would like to talk up here and not give you an answer that is helpful.

In addition to feeling course work rigor, for women of color in STEM, the intersection of multiple identities and the influence on post-transfer classroom experiences exists. In Sara's situation, she was not only the only woman, but also the only Hispanic/Latinx person in her aviation program. She expressed concern when she realized that she would be the only woman in her cohort. By the time Sara participated in the Y2 interview she switched from her double major in aviation and business management to just business management, but here she shared thoughts about when she initially transferred and was in the aviation major.

> I honestly felt like kind of scared a little bit because I was like, oh shoot, I'm the only woman and I'm afraid they might be discriminate of me sometimes or like, yeah like they won't really like take me too seriously or anything like that. But I guess like the teachers they kind of like recognize me like being always in class, never missing a single day, always getting my work done. But like I kind of felt like nervous a little bit cuz I was like the only girl and I felt like I was doing it alone instead of like, cuz like for me I feel like if it was like another girl like uh, it would be much easier to talk about, Oh did you do this homework? Oh like you know, are here. And then like all the other classmates, they were kind of like friends with each other but not really friends. They were like in the

wrestling team so like they were all like knew each other and I didn't really feel like I knew them. Yeah. So I felt kind of like a little bit shy talking to them.

Sara recognized her uniqueness and what her presence meant for the aviation program. By being a woman in her major, Sara believed that alone could challenge the social view that aviation is an industry for men. The isolation of being a woman in an aviation program, coupled with feelings of course rigor lead Sara to develop friendships with women in other majors. She did not have other women support systems while she was an aviation major, but had developed relationships with others on campus in different majors through participating in university clubs outside of her discipline.

The impact of racial identity and the intersection of gender was important for two of the women in life science majors. Beth, a health science post-transfer student in an online bachelor's degree program, and Liz both discussed that they are one of the few African American women students they see in their STEM classes. A commonality among Beth and Liz was their perspective on the importance of broadening participation in STEM. Beth shared her thoughts on the importance of outreach to younger students as a way to "shed light on other careers" with a STEM focus. She also made suggestions as to how to connect STEM subjects, like mathematics, with real world situations to draw more students in. Beth discussed the importance of outreach to middle and high school students because "they're most influential at that time."

During Liz's interviews, she spoke broadly about the impact of representation and the power of feeling like you belong, and made the connection between those two concepts in a STEM classroom environment. Liz was in high school when she witnessed Kamala Harris sworn in as the Vice President of the United States and it brought her joy and optimism to see a biracial woman like herself in a position of power. At the same time, Liz commented on that she often

feels that she is isolated as the only one in academic spaces that hold her identities. Liz is interested in pursuing environmental biology and commented on how she does not see many people who look like her. For Liz, the lack of representation is a motivator. She has felt in the past that there are people that have wanted to push her out of STEM spaces, but that gives Liz incentive to persevere. Liz describes the sense of motivation coupled with frustration.

> So, I mean it's encouraging, but it's also heavy because once you're there, a lot of people are probably going to be like, what is she doing here? But yeah, no, it's encouraging, but at the same time I'm like, I don't see anyone else like me in this room and that's horrifying.

Liz's experiences as one of a couple of women of color in STEM classes has been a driving force behind her interest in being a trail blazer for the next generation. As an older sister, she has a desire to be a role model to her sister. Liz encourages women of color in STEM who are current community college students to not let anyone "push you out of the room" and to be resilient, even at times when you feel challenged by instructors or fellow classmates. She also shared the advice to other women in STEM to reach out to each other and network as a group.

Women of color in STEM who transfer from community college encounter difficult courses in addition to often being the "the only" or "one of a few." For some, being "the only" was in reference to their gender, for others it referred to their gender and other identities they held. The intersection between their gender and other identities that are historically underrepresented within STEM contributed to their feelings of isolation in classroom experiences. Gender identity and classroom experiences was most impactful on the women in PEMC and life science majors.

The Loss of Personal Connection Post-Transfer

Reflecting on the benefits to attending community college, a common thread that weaved in participant descriptions included feeling of comfortability and ease. In part, this can be from being close to home and having the proximity of familiar support, but there are also built in features within the community college that creates a comfortable environment. For example, the small class sizes at community college were described as "huge advantage" by post-transfer student Jill. The small sizes of classrooms provide the opportunity to get to know the instructors. The smaller size gives space for a sense of community. Upon transfer, participants described a new environment with a period of adjustment. Initial feelings were of a sense of loss of personal connection and thinking about if it would have been easier if they started directly into their bachelor's degree program and bypassed community college. For pre-transfer students, when they spoke about foreshadowing post-transfer adjustment, there was overlap with what post-transfer students described. In addition to what was an initially surprising loss to personal connection, there was also shared experiences of forming post-transfer connections.

Experiencing and Anticipating a New Environment

The culture of a community college can really differ to bachelor's degree serving institutions and the post-transfer participants in the study felt the shift. Transfer students entered their post-transfer institutions without a built-in social network. The initial lack of personal connection, coupled with minimal transfer student supports at the institution, left a shared feeling of a surprising loss of personal connection. Some participants wondered if they went directly into a bachelor's degree program if they may have bypassed this feeling of loss of personal connection because they would have had been in the position to build that starting their first year. Additionally, with the COVID-19 pandemic in the backdrop, some study participants went from

being in fully online classes due to the timing of the pandemic, and then entered back into the classroom post-transfer. Jane provides an example of this. She thrived off online learning, enjoying the individualized pace and found that it helped her with her disabilities, but described it as “I haven't had like the proper university experience, I would say in terms of being extremely social with classmates and stuff.” Both in the online and in-person classroom space, Jane felt the pre-transfer, smaller environment, was more personable. The smaller classes foster more peer-to-peer and faculty interactions. Maya noted that community college classes allowed for critical thinking and more classroom discussions that she was not experiencing post-transfer.

Pre-transfer students talked optimistically about transfer success in regards to anticipated credit mobility, but in terms of experiences, there were shared feelings of anticipating differences and perhaps a lack of personal connection post-transfer. For example, Charlotte talks about the unknown after transfer compared to her current experiences at community college.

> Smaller class sizes and being able to build a connection with every person I've had as an instructor has been pretty interesting. I don't know if I'll have that experience at a four-year university, but that's certainly been my experience at [community college].

Similarly, Liz, who is optimistic about post-transfer adjustment, also pondered what the connections will be. Liz had a very strong and positive experience in her community college, that provided very good classroom support and external opportunities in STEM.

Making Post-transfer Connections

The participants described shared feelings of isolation post-transfer, but also shared how they overcame that and made social connections. The essence of personal connections that were developed was a commonality among the post-transfer participants. For some women, the personal connection came from other students who shared similar social identities, both inside

and outside their major. This was described by Sara and Maya. As the only woman in her program, Sara participated in several clubs outside of her major and developed connections with women that way. For Maya, as an international student since high school, Maya did not have many peers or friends that shared her nationality. After some time, post-transfer, she found a very strong group that provided a personal connection.

> I would say it's definitely fun to, um, know girls in STEM fields that you don't feel like the only, the only one and also some, um, female Chinese international students, because like most of us are only child. And I think they're just a lot more we can talk about as, you know, the only, you know, girl in the family, but we're, we're, we're very far from our family since a young, since young age.

In this situation, she found connection among other Chinese international students who were at the university during the summer. "I finally felt like, okay, now I feel like I know people. And since, um, I took more major classes, started seeing more familiar faces." Although Maya entered her post-transfer institution with feeling alone, after some time she met several other Chinese international students, both within and out of her major.

The establishment of a personal connection can come in different ways and take time to develop. Common with transfer students, many of the women in the study had outside commitments such as children, having a partner in the military who was often traveling that left them as the sole person to be responsible for home life issues, and working while in school. There were also women who were adult learners. Although there was differing social identities, the essence of a loss of personal connection from changing to a different type of educational institution was a common presence. It was also a shared commonality of overcoming the loss of personal connection and developing new ones. This sometimes came as supports within a

classroom, involvement in a club, or in Liz's case, her research lab promoting connection among fellow lab mates. Discussion on the role of social networks will be explored in the last theme that will further develop the importance of personal connection in the form of support.

Feeling Behind and Other Perceived Roadblocks for STEM Transfer Students

The sense of feeling behind and the identification of perceived roadblocks as a transfer student was a shared commonality among participants, regardless of being pre- or post-transfer status. Post-transfer students were able to speak directly to their credit mobility outcomes, whereas the pre-transfer students were only able to speak to their anticipated outcome. In addition to credit mobility, pre-transfer and post-transfer students think about pre-requisites completed at community college or waiting to take until post-transfer. Some students prefer taking as many pre-requisite courses at community college, but unfortunately there are sometimes misunderstandings of anticipated coursework transferring. For post-transfer students, the sense of not feeling prepared by coursework completed at community college was a shared experience among some participants.

Credit Mobility Concerns

Satisfaction of credit mobility can vary, but for many students in STEM majors who start at a community college, they experience credit loss. The level of concerns around credit mobility differed between pre- and post-transfer participants. For some, the credit loss is not considered a disappointment. For example, pre-transfer computer science student Charlotte spoke in confidence that 43 of 70 credits will transfer and she was very satisfied with that. As a STEM student in computer science, she felt that she needed to take computing courses at community college that she was aware would not transfer but felt they would better prepare her and she did not have regret of the future credit loss. The other pre-transfer students (Alice, Jane, Lilly, and

Liz) felt positive about credit mobility satisfaction, but also were anticipating feeling behind once they transferred. Charlotte described how she feels about transferring into her bachelor's program as, "I'm nervous because it feels like I'm starting over at this point."

The unexpected lack of credit mobility was a shared experience across many post-transfer students. Eve, a polymer and color chemistry major, found out post-transfer that a microbiology course she took at her community college would not meet her major microbiology pre-requisite requirement.

Sara transferred from her community college into an aviation major at a small private university. Sara was disappointed when she found that only 22 of her 60 community college credits transferred. Sara's feelings of helplessness were expressed in her Y1 interview.

> For me, I didn't talk to anybody because I was like, since they can't transfer anymore classes, I don't know what I could do to make them transfer more classes. Or if I talk to them, I think, will they transfer? I don't think they will transfer anymore classes. So, I was like, no, I kind of gave up at then.

During the Y1 interview, Sara shared feelings of disappointment about a mathematics course that did not automatically transfer into her bachelor's degree. Sara planned to wait to take that particular mathematics course in her senior year. At the time of the Y2 interview, Sara gave an update on the mathematics course. Through resiliency, persistence, and self-advocacy, the registrar's office removed the mathematics course requirement and allowed Sara's community college mathematics class to satisfy the requirement.

In this study, findings supported that credit mobility was a considerable consideration for the participants when selecting courses at the community college, but for some post-transfer students in PEMC majors they felt satisfied with their credit mobility even when not all courses

transferred into their bachelor's. Olivia, a post-transfer electrical engineering major, and Charlotte a pre-transfer computer science major, both took computer science classes at community college that they knew at the time would most likely not transfer. Olivia went into taking a computer science class with the knowledge it may not transfer, but at the time was not sure what major she would pursue. Charlotte, who had plans to transfer into a computer science bachelor's program explained why she took a software development course that she knew would not transfer into a bachelor's degree.

> That was a really good choice especially if I'm going to be a computer science major because I don't think there are a lot of coding classes at [institution], not in general like that. So, I think that was a good choice.

Directly connected to credit mobility was the idea of preparedness for post-transfer classes. The unknown of course rigor post-transfer left women with trying to strategically think about at what institution was it best to take what course. Starting in community college offered several benefits, but for some, post-transfer experiences left them with feelings of being underprepared for their major.

Not Sufficiently Prepared

A commonality among the participants in PEMC-STEM as it related to courses and credit mobility was experiences of challenges and barriers. Challenges included the differences in course difficulty between experiences at community college and a four-year university. To further impact that, some women experienced a barrier to support within the classroom from the change of a smaller class environment to large classroom experiences upon transferring. An example was Mia. Mia, a post-transfer construction management major, had a hard time adjusting to her post-transfer university. She felt that her community college curriculum was

easier, and that her study habits from her community college did not sufficiently prepare her to keep up within her post-transfer program. As I explored life science STEM major course and credit mobility experiences, the participants also shared stories of challenges and disappointment, but there was lesser common experience that came through as compared to PEMC-STEM students.

Harper, a post-transfer exercise physiology student, had a different approach to enrolling in science courses while at her community college. Harper was cautious about course selection as a pre-transfer student when she was attending community college due to fears about credit mobility into her four-year degree program. Unlike Jane, whose approach was to take to her mathematics courses at community college, Harper focused on taking general education classes at community college that she felt confident would transfer. Harper did not have associate degree aspirations prior to transfer. Although satisfied with the credit mobility post-transfer, in hindsight Harper expresses some regret not taking science courses while at community college.

> I would've taken a few of my sciences there, like my anatomy and physiologies, some of my chemistries, some physics, things like that. Or I would've tried to break them up a little bit. But I learned that if you took one anatomy and physiology at say [community college] you have to take the other one there. Whereas if you took one chemistry at [four-year university], you had to take the other chemistry at [four-year university]. So that's why I tried to not do all my sciences because I wanted them to come from the same college so I wouldn't have to transfer them, or get stuck when they wouldn't transfer. So that money didn't feel like it was wasted. So, I wish I had done some more of my sciences at [community college].

For Liz, a pre-transfer AS student interested in environmental and natural sciences, she felt that her community college did not offer enough higher-level biology classes. Outside of a microbiology course, Liz found that there were not many other course offerings in that discipline. When sharing what advice she would give to community colleges, she recommended to shift their focus to curriculum for transfer intention degrees over work force training programs.

Alice, Jane, Harper, and Liz shared their reflections on course work and challenges that they each uniquely experienced. Alice and Jane shared their experiences in science classes at community college that they found challenging and their experiences took a toll on their emotions and transfer timeline. Harper approached her science courses differently and decided to wait until post-transfer, but she was not fully confident in that choice. Whereas, Liz was seeking out higher level life science courses in her community college, but felt there were not enough offered. Similar to PEMC major, the participants in a life science major shared stories of difficulties with courses. The subset of behavioral science majors had a very different experience, particularly on satisfaction with credit mobility.

Can't Do it Alone: Leaning on Support Networks for Success

The commonality of transfer students leaning on support through social networks was present among all participants. The type of support went beyond academic and institutional knowledge supports. Financial, motivational, and emotional supports were identified as having positive impact on the transfer journey. In this study, the women talked about significant influences in their academic journeys that included family, friends, and educators. First-generation college students had unique support needs that were shared by over half of the participants. As women of color in STEM, there are additional barriers to success which makes a

strong support system both in and outside of the classroom significant. Pre-transfer student Liz articulated the unique experience for her as a woman of color in STEM. She provided a narrative of how she sees her support in STEM that I felt several of the participants shared similar feelings through their own stories. She spoke of how she often feels supported within the STEM community, while at the same time has overcome times of challenges through her optimist outlook. Liz shared her thoughts, "I feel like wherever I go, people in the field want to see me winning. Either they want to see me winning or they hate that I'm there, but most of the time it's the first option." The following sub-themes will focus on different types of support available that the women leaned on to position them to keep "winning" within their educational journey.

Educator Support

The necessity of support from educators in transfer decisions and processes was present for all, but also varied in degree. Over half of the participants identified as first-generation college students and that identity often factored into who those students went to for educational supports. As a first-generation college student, Emma sought out support from teachers both at her early college and her current instructors in her four-year university. She leaned on educator supports because "they've all went to college, they know what it's like, and they've all been able to listen to me and provide me the best support as possible to me."

Educational supports also came in the form of early education experiences with educators. Nine of the participants (Jill, Maya, Sara, Charlotte, Olivia, Alice, Harper, Jane, and Liz) mentioned educators as having significant influence in STEM educational choices. Jane's experience with a high school veterinary assistant teacher gives a strong example of the power of personal connection and decision making. Jane's experience after being admitted into a high school magnet program for veterinary technician and her interactions with a particular teacher

changed the trajectory of her post-secondary academic direction. Jane originally had an interest in criminal justice, but the exposure to veterinary science led Jane to become a certified veterinary assistant and decide on being a biology major. This positive experience in high school not only influenced post-secondary education choices, but also was the start of Jane making educational choices that will get her closer to her veterinarian career goal. Jane credits her teacher for helping her get through biology, a subject that Jane noted having particular troubles in.

Another prominent example of educator support was with Liz and her experience with a community college earth science instructor. The support she received from her instructor kept her excited about being in STEM, had an influence in the type of major she plans to pursue post-transfer, and connected her with a summer internship program at a maritime museum. The support from this community college educator canceled out the negative feedback she received from a high school chemistry teacher.

The support from educators for students who identify as a first-generation college student was present. Another type of support that was less of a commonality, but of importance to mention, was support from educators who were also women. For example, Maya often expressed doubt in her ability to be a strong statistician, but she talked about how encouraging it was to see women as some of her statistics professors.

> They're women, it's encouraging. And I think also impressive to see them teach those really hard courses and being just a very brilliant statisticians as women. For sure, I think as students, when you sit there, you can just be like, they're so capable of doing the same thing and they also earned their place and most of them are very helpful.

For some women, they shared their feelings of wanting more support from women who are in STEM. Notable examples included Beth (Y1 and Y2) and Charlotte (Y1) who gave examples of how they contribute to providing motivational and encouraging support for future STEM students. Both shared thoughts around the importance of introducing young women to STEM. Beth talked about how she does not see many other African American women in STEM education, but notes "we're out there, and I guess the best thing that we can do is to continue on and spread light to STEM programs." She continues to go on and speak about the importance of reaching young women of color in middle school and high school as a way to broadening STEM participation. Her ideas of outreach to younger women is in essence the highlighting the value of providing girls with early exposure to STEM.

As part of her on campus employment at her community college, Charlotte is doing just that. She works on STEM events for middle and high school students and is directly providing experiences that contribute to STEM capital gain. Charlotte has found that there can be reluctancy from younger students to talk about STEM, but she is very conscious of the importance to speak to them about STEM opportunities. Here Charlotte describes why she goes out of her way to talk to middle and high schoolers about STEM programs at community college.

> In those experiences that I've had, it's been really important for me to seek out students that are female and also other ethnicities to talk to about STEM. Not a lot of people that look like me are into STEM. I think that's something that I think it should change, and I think there should be more diversity in STEM fields.

As an adult learner, Charlotte had a confidence in talking about her experience of her gender and race in connection with her major choice in community college. Several of the participants made a linkage between social identities they hold and the supports received from

educators. Some also articulated the supports they would like to see more from educators who hold shared identities.

Family and Social Support

Overwhelmingly, participants' family members and some close friends were identified as significant influence on their educational journeys. The influence did not necessarily mean academic support. For some, the influence was from emotional and motivational support. For Maya and Sara, their parents played a part in motivational and financial support. In Charlotte's social network, her fiancé is a significant influence on her transfer journey, as he is experiencing it at the same time. With both herself and her fiancé having transfer aspirations she said that they have, "been comparing notes as far as transferring and what's required and what we need to do." Emma spoke about only having a few family members, most notable two of her cousins, to discuss college plans. As a first-generation college student, her cousins were the only others in her family that pursued bachelor's degree and were able to give Emma the support and motivation to keep persistent at times when the weight of being a bachelor's degree student was particular challenging.

International students in the study, Olivia and Maya, discussed the influence of their parents on their educational choices. Olivia, a post-transfer electrical engineer major, found her family network to be very impactful on her choices. In particular, Olivia's parents were significant in her initial educational decisions. Her parents wanted her to receive her post-secondary education in the United States and did the community college application on Olivia's behalf. The community college was chosen in part for its proximity near family in the United States. While exploring post-transfer institutions, Olivia also relied on a cousin who previously attended where she ultimately transferred. Maya's parents also suggested for Maya to study

outside her home country. Her parents, who work for universities, counseled her on her decision-making processes. In addition to family support, post-transfer Maya spoke to other international students who also transferred from community college who she found to be helpful sources for information, provided her a social network, and grew to become a major part of her social network to lean on.

The participant's social networks contributed to transfer and STEM social capital. These forms of capital drew the women in STEM and also contributed to positive skills gained for transfer student success. Social networks come in the form of educators, family, and friends. Social networks are part of contextual influences that have influence on identity development meaning-making capabilities.

Support Strategies within Community College

As much as individuals, for example family members and educators, can be impactful on educational decisions and provide supports during the educational journeys, higher education institutions also create ways to provide support to students. This type of support may come from specific offices that offer programming for academic and study skills support. In the Y1 interview, the question was asked "What are some sources of information you have used to learn about your transfer options or the transfer process?" This question elicited responses that described supports from academic related courses (ACA) and on-campus programs, for example the United States Department of Education funded TRIO programs.

A common thread among participants was the supports embedded in community college that leveraged their transfer planning and transfer success for the post-graduates. For example, Liz and Beth, were both in the TRIO programs offered at their community colleges. As participants in TRIO, both women shared examples of transfer student capital that was acquired

through TRIO. Liz talked about how her TRIO advisor provided support that fostered her success. The advisor helped her explore post-transfer institution options. Liz's TRIO advisor would share resources such as virtual tours of bachelor's degree serving institutions. Beth also credited her time in the TRIO program to helping her explore post-transfer institution options. In addition to assisting Beth gain knowledge of the transfer process, she also had access to extra help with studying that contributed to transferable study habits post-transfer.

Community College students in North Carolina have the opportunity to enroll in an ACA course. ACA courses have a direct impact on providing transfer student capital. There are ACA courses designed for student support for to aid in preparing to transfer. In Y1 interviews, eight of the women (Mia, Alice, Liz, Harper, Jane, Sara, Emma, and Jill) shared their experience with an ACA course. When reflecting on her experience with ACA, Liz shared that the course "helps you get your mind straight, and helps you really narrow down what you want to do." Another form of support Liz received from her experience with ACA was skills on how to communicate with professors through email from an exercise in the class where students had to "write a proper email to a college professor." Harper also shared that ACA contributed to her exploring what post-transfer institution would be a good fit and also with her long-term career goals.

ACA courses also provided participants an environment to set goals that some women found to be a useful type of support. For example, Emma found ACA to be helpful in goal setting and gaining practical transfer capital skills.

> It was very helpful. We spent a lot of time looking at universities and talking about our plans during early college and after college. It was very helpful in looking at setting goals for our self. We talked about how to budget and manage throughout college as well, which was very helpful.

Each woman held attributes of personal strength and resiliency that influenced their persistence. Additionally, the impact of support from others in connection to their success, shone through the narratives the participants provided. Support comes in different forms. For some, supports from within their educational setting was vital to their success. Support structures within community colleges helped the participants feel more prepared to both make transfer decisions, such as exploring institution types, and prepare for transfer. Family support was equally important and came in different forms. For some women, they sought support from family members who experienced the transfer experience, or were current students too. Others leaned on family for financial support, such as living at home while in college, or help with tuition costs. The overwhelming support shared was the motivational and emotional support that kept participants going in times of stress and moments of doubt. For some, a commonality was the intersections of identities, between gender, race, and first-generation and how that influenced who they found to be a strong support.

Summary

A post-intentional phenomenological approach, in tandem with the use of the RMMDI theory as a guide, gave me the opportunity as a researcher to explore in depth the individual experiences the women had in STEM within the context of transfer experiences. The longitudinal nature of this study further supported the use of the RMMDI, as a way to explore salient identities and draw connections between contextual influences and identity self-perceptions. The timespan between Y1, STEM, and Y2 interviews permitted me to explore my research question around social identities and how they inform STEM-related experiences for women of color in STEM majors. Contextual influences are fluid and as they change so can the self-perception of

ones' identities. How individuals self-perceive their identity can play a pivotal role in the academic direction one choses.

Chapter 5 will provide a summary of each emergent theme and a discussion on the relationship between the themes and posed research questions. In addition, the next chapter will discuss recommendations for future research and share ideas on how these findings can contribute to recommendations to higher education professionals who work with women of color transfer students in STEM.

CHAPTER FIVE: DISCUSSIONS, RECOMMENDATIONS, AND CONCLUSION

Summary of Findings

In this study, I focused on women of color and their unique experiences as community college transfer students in STEM majors. There are few studies that have addressed specific experiences of women of color in STEM and community college transfer (Allen et al., 2022; Jackson, 2013; Reyes, 2011). Fourteen women who were participants from a larger study on transfer experiences in North Carolina provided interview data that were analyzed for this study. Out of the 14 participants, six women participated in a STEM-focused interview that was specific to this research project. Through receiving the narratives of six women over the course of three different interviews (Y1, STEM, Y2), I attempted to contribute to this unique research and provide additional qualitative data on the subject of transfer experiences connected to women of color in STEM. In this chapter, I will discuss my five key finding that include (1) the internalization of community college stigma, (2) blindsided: post-transfer rigor, (3) the loss of personal connection post-transfer, (4) feeling behind and other perceived roadblocks for STEM transfer students, and, (5) can't do it alone: leaning on support networks for success. I identified and developed subthemes that were embedded within each thematic finding. Whereas the thematic findings highlighted the broader shared essence of experiences within transfer experiences, the subthemes allowed for exploration of specific commonalities within experiences. Lastly, this chapter includes a summary of my analysis of the participants' self-perceptions on identity and meaning-making capability guided by the RMMDI.

At the outset of designing the study, I anticipated the use of Crenshaw's intersectionality as a complementary framework to the use of RMMDI. Participant interview data highlighted multiple identity experiences, and the intersection of identities in general, but did not shed

insight into centering systems of power in higher education and how women of color are situated within these systems. In the end, I explored the individuals' multiple identities, and the self-perceptions on identity and meaning-making capability. The exploration of contextual influences in the form of the environments in which the women grew-up, their family, and K-12 education was done. The consideration of the impact of contextual influences on identity development is in alignment with the RMMDI framework (Abes et al., 2007).

In this chapter, I discuss the connection between my findings and prior literature. I also make note of when I found gaps in the literature and how this study, and future studies, can continue to contribute to the subject. Additionally, I discuss literature on transfer student experiences and relate that to literature specific to women of color in STEM, and further show how this study contributes to limited empirical research on the lived experiences of women of color STEM transfer students.

Discussion

The Internalization of Community College Stigma

In this study, descriptions of stigma and doubt over choosing community college as the entry into higher education came out in several of the interviews. This phenomenon led to a shared essence of the connection between transfer experiences and stigma. Jenkins (2014) defined stigma as "the gap between the virtual and the actual, and the shame that attaches – or would attach – to its discovery by others" (p. 97). There were nuanced differences between the type of stigma the women felt. For some, their own preconceived idea of what going to community college means and the fear of it being discovered or judged by others was their internalized stigma. This was evident with the high achieving students. The choice to start at a community college left them feeling doubt in the decision and questioning how others may

perceive it. The shared essence of stigma was found as the participants grappled with going to community college for varying stigmatized reasons. For some of these women, they had applied and been admitted into a bachelor's degree program, but landed in community college for mainly financial reasons. There was a sense of "missing out" by not going directly into a bachelorette degree program that contributed to feelings of stigma. For some, the close proximity to home was a benefit of community college, whereas for others it was a drawback and contributed to feelings of shame and stigma.

The findings in this study were similar to what Shaw et al. (2019) discovered in their qualitative research on stigma and community college transfer students. Shaw et al. (2019) also noted a range of uncertainties that transfer students face when transitioning into a bachelor's degree program that lead to feelings of stigma. This included stigmatized feelings about academic ability post-transfer, credit mobility, and a change in their living situation (Shaw et al., 2019).

Abes et al. (2007) describe a "relationship between social identities and the core of identity" (p. 6). Depending on the individual, differing social identities one holds can be closer to, or farther from, the core identity (Abes et al., 2007). I found that gender identity connected to feelings of stigma for some women in the study that indicated their gender identity was closer to their core identity in the context of classroom experiences. The participants were often one of a few women in their classes which added to their feelings of stigma. In addition, I found the intersection of marginalized identities further compounded feelings of doubt and stigma. The findings in my study support and are similar to Reyes (2011), who found that women of color in STEM classes are often the only or one of the few and that results in feelings of isolation. The intersection of being a transfer student with marginalized identities put the women in experiences

where they encountered peers and instructors who do not think they have been prepared by their previous course from community college (Reyes, 2011).

In addition to academic and gender related stigma women of color transfer STEM students faced, I also discovered that first-generation college students encountered social stigmatization for choices that differed from what their family members have made. I found that there was a dichotomy between family members providing the motivational support while at the same time having the sentiment of not understanding choices that went against what other family members have done. Dika and D'Amico (2016) examined how there is a large institutional enrollment of first-generation college students and compared the experiences of first-generation students in STEM and non-STEM majors. Characteristics of first-generation college students include that they are more likely to be transfer students and hold a racial identity that is historically underrepresented in STEM (Dika & D'Amico, 2016). Previous studies on first-generation college students in STEM majors reinforce the importance of academic supports to this population's retention and persistence in STEM (Dika & D'Amico, 2016). In London's (1989) groundbreaking research on first-generation college students "breaking away," interviews disclosed that educational mobility among first generation college students does provide a gain, while also a "loss of a familiar past" (p. 168).

In this study, some of the first-generation college students found themselves in a position of defending how challenging their coursework was and feeling that they had to justify why they had to spend so much time on it. This led to needing to explain their decisions to not enter the workforce full-time and pursue an education first. Although this type of stigma is not necessarily the type of stigma related to community college as previously conceptualized (Turk, 2019), I found that it was a common thread among the first-generation women in this study that was

significant and adds to another complexity to the experiences for first-generation college students.

Blindsided: Post-transfer Rigor

A common thread among the participants was the perceived rigor of STEM courses. Some pre-transfer students in this study already had challenges with academics in STEM courses that left them with changes in their transfer timeline and feelings of doubt. There were also differing perceptions of course rigor depending on their STEM major. The post-transfer students in this study referenced feeling challenged by the coursework and being in a new classroom environment. Participants who took their STEM prerequisites at community college did report not feeling as prepared by their prerequisite classes.

There are similarities in what I found with prior research on post-transfer course rigor compared to classroom experiences in community college. My findings supported previous literature on how in general, post-transfer students enter into what they perceive to be a more structured and rigorous curricula (Wang, 2020). Upon entering a new institution, the post-transfer atmosphere also comes with a different pace, differences with faculty support, and a new classroom context compared to their community college experience (Packard et al., 2011). Bahr et al. (2023) honed in on institutional differences, over the actual rigor of classes, and argued that it is not that community college classes are not rigorous, but rather additional institutional changes add to the feelings of post-transfer rigor.

As my findings supported feelings of unpreparedness, prior research has explored the responsibility of the community colleges and post-transfer institutions to address how they can minimize barriers and leverage community college experiences. Bahr et al. (2023) found that the challenges of the new environment do not equate to community colleges not sufficiently

preparing students for post-transfer in STEM. For example, transfer students who did not take their pre-requisite course work at the post-transfer institution found classes difficult because their instructors taught in a manner that assumed all students took their pre-requisite requirements at the same institution (Bahr et al., 2023). This notion left transfer students having to do additional work to understand references that they were not familiar with due to taking their pre-requisites at community college (Bahr et al., 2023). In my study, I did not know if faculty made the same assumption that most students took the prerequisite course work at the same institution. I did find that for many of my participants, they were one of many transfer students in their classes. Although my findings differ from Bahr et al. (2023), I do think their research findings on faculty assumptions on students is valuable and worth further exploration in transfer study research.

My study explored women's experiences and the saliency of gender identity in STEM classroom experiences and challenges in the classroom. Participants were in a range of varying STEM majors and I found that the salience of gender identity and classroom experiences differed among the different type of STEM majors. My finding is similar to prior research on the nuanced differences across STEM majors. Depending on type of STEM program, some fields strike a greater gender-balance over others (Bonham & Stefan, 2017). Bahr et al. (2023) believe that there would be benefit in more research on both race and gender experiences of STEM students as a way to better "identify strategies to facilitate STEM degree attainment via transfer" (p. 586). This study is attempting just that, by looking at intersections of identity and impacts on STEM classroom experiences.

The Loss of Personal Connection Post-Transfer

There is a sense of comfort and connection for students at community college. That was the common sentiment of the participants in this study as they reflected on their experience at

community college. Community colleges are often close to home and offer an atmosphere that promotes personal interactions with peers and instructors. Proximity to home continued to be a priority for many post-transfer students, but other participants were selecting the best option regardless of geography, while pre-transfer students were still weighing options. For post-transfer students who selected a university near to their home, in general, they still encountered cultural differences in experience between what they had in community college and four-year institutions. In this study, the differences in norms (Jackson & Laanan, 2015) around the initial loss of personal connections was a shared commonality. For post-transfer students, they were able to speak from direct experience, whereas the pre-transfer students shared what they anticipated to happen after transfer. Although there was a shared experience and anticipation of personal connection loss, there was also a shared commonality of building connections post-transfer.

STEM courses have a unique set of barriers that contribute to low participation rates for historically underrepresented groups. The experiences in STEM pre- and post-transfer can be different. Allen et al. (2022) found that community college environments promoted a positive STEM classroom environment. The smaller class sizes contributed to a favorable environment for students to have higher levels of peer-to-peer interactions. The culture of support from instructors and advisors has also been shown to be high at community colleges (Allen et al., 2022). The issue is that high achieving students in community college, coming from a supportive institutional culture, does not equate to the same experiences post-transfer (Allen et al., 2022). Students in this study found larger classes challenging and that their post-transfer classes did not allow for as much communication between students within the classroom. This finding supports

what Reyes (2011) found over a decade ago that transfer students can feel “invisible” and “lost” in the large lectures (p. 245).

It is important to highlight that in this longitudinal study, only one woman (Sara) left her STEM major for a non-STEM program. Sara was the only woman and Hispanic person in her aviation program cohort. The peer relationships she forged were all outside of her major. For the other women in the study, they persisted in STEM and gradually formed new connections. There were examples of women participating in clubs and research experiences where they created new connections with peers. Outside of academic settings, other women found connections informally and those informal gatherings forged new relationships.

My findings on the lack of personal connections directly after post-transfer, the negative consequence that can have, and how building new connections formed positive relationships have similarities to findings from existing studies on STEM experiences. Prior research has found that the absence of community can lead to moving away from STEM (Ong et al., 2017; Rainey et al., 2018). Solorzano et al. (2000) explained how African American students experience the racial climate at their college. Findings indicated that informal gatherings referred to as counterspaces, among those who have shared social identities, contributed to positive racial climate on campus (Solorzano et al., 2000). Ong et al. (2017) continued to study the role of counterspaces and how these informal gatherings provide a safe space and a sense of belonging that filled a void missing from inside traditional university spaces.

Feeling Behind and other Perceived Roadblocks for STEM Transfer Students

Across the STEM transfer participants, challenges that created roadblocks included credit mobility, academic, and social challenges in the classroom. A barrier that participants encountered was surprise in loss of credit mobility. Credit mobility, or the loss of credits or lack

of application of credits to major requirements, has a relation with successfully completing a bachelor's degree (Hodara et al., 2017). The other roadblock I found was the shared feeling of not feeling academically prepared for the post-transfer courses in STEM subjects. For some, this was felt post-transfer, while some pre-transfer students anticipated the course rigor to increase once they were in their bachelor's degree program.

I found nuanced differences in credit mobility satisfaction levels between different types of STEM majors. The participants in this study fit into three types of STEM majors: PEMC-STEM, life science, and behavioral science. The PEMC post-transfer students experienced higher levels of credit loss and feelings of frustration post-transfer. Differing from PEMC and life science majors, the behavioral science students had extremely high satisfaction with credit mobility. The women in behavioral science programs reflected on their experience with transfer credits in their last interview that was conducted during last semester of their bachelor's degree programs. As students who were completing their degree, they were able to talk about their complete experiences. This included having satisfaction with credit mobility, and a strong sense of belonging within their major classes. The roadblocks that these students experienced were personal challenges that surfaced along their journey in post-secondary education. Financial difficulty and setbacks related to disability were noted as roadblocks that had serious potential to hinder success.

My findings supported research on the importance of transparency in credit mobility policies. As community colleges and bachelorette serving institutions work towards increasing transfer policies to make credit mobility transparent, there still continues to be a significant percentage of students who experience credit loss associated with delayed completion (Hodara et

al., 2017). In this study, the experiences of a majority of the post-transfer students in PEMC majors align with this phenomenon.

Prior studies on articulation agreements provided me a context of the system my participants were part of. Participants in my study were all attending higher education institutions in North Carolina. North Carolina has statewide articulation agreements (D'Amico & Chapman, 2018). Articulation agreements came out of a need from community colleges and four-year institutions to better support students with transfer and bachelor degree aspirations. Articulation agreements between community colleges and bachelor degree serving institutions provide an outline on course transfer policies for specific academic programs (Montague, 2012). The creation of articulation agreements was to help students in their success of both transferring into, and graduating with a bachelor's degree. For the participants in my study, they still experienced unfortunate issues with credit mobility expectations. This aligns with what Taylor (2017) found that articulation agreements can be extremely hard to understand for the average community college student due to the complex language and how the sentences are structured in the written policy.

The second roadblock that the women shared was the sense of not being sufficiently prepared for post-transfer classroom experiences. Course-level difficulty and overall classroom experiences were explored among the differing STEM majors. Participants did not overtly disclose course grades, but several shared their experience with coursework in community college versus coursework within their bachelor's degree. Cejda (2006) refers to the lowering of grades post-transfer as transfer shock. Reyes (2011) identified challenges for women of color transfer students in STEM and concluded that transfer shock was a notable factor that affected their unique experience. Reyes (2011) connected how transfer shock and isolation together

further exacerbated potential challenges. In this study, not all women described experiences of both transfer shock in tandem with feelings of isolation; however, for the women who did have that encounter, it did have significant impact on their sense of belonging and academic achievement. Participants who described course content challenges, but were in a supportive environment and interacted with others who shared similar identities, were better positioned to manage any negative experiences.

Can't Do it Alone: Leaning on Support Networks for Success

The final emergent theme was that educational journeys are not done in isolation, and that leaning on networks for emotional, motivational, academic, and financial support was part of success. Different types of systems, such as family, education, and environment, created unique support networks. Each participant in the study shared stories of their support network and the ways in which they leaned on them during various parts of their transfer journey. Several of the women started building their support network in STEM while in K-12; others found support while at community college in the form of classroom and programmatic supports. Support from family and close friends, often in the forms of emotional and motivational support, was a shared experience. Jabbar et al. (2017) found that nearly all Latinx students in their study named "words of encouragement" from family as a critical factor in academic persistence (p. 263). I also found this to be true for the participants in this study. In addition, my findings on the value of a support network are similar to previous research on transfer student capital (Laanan et al., 2010), STEM social capital (Saw, 2020), and the linkage with capital gain and persistence in STEM.

I found that specific individuals and close personal connections that the participants in my study referenced were part of the capital knowledge transfer the students received. The participants in the study shared who they found to be influential in their educational journey,

specifically as it related to being a student in a STEM major. Those individuals contributed to the participants' capital gain and skills learned helped them as transfer students.

My findings on support networks in the form of educators and in community college programming directly supports prior literature on transfer student capital. For example, I found that ACA courses and programs like TRIO contributed to capital gain that had influence on transfer success. This is similar to how Laanan (2007) described transfer student capital as the experiences community college students gain while at community college. These experiences included knowledge gained on credit mobility and the overall transfer process. In addition, Laanan et al. (2010) added the understanding of financial aid and the study skills acquired while at a community college as forms of transfer capital. The more knowledge students have on the transfer process and the acquired skills from community college correlated to the higher probability of transfer success and retention rates post-transfer (Laanan et al., 2010).

I found that the positive early exposure in STEM experiences had an impact on educational choices for the participants. Literature on STEM social capital refers to early experiences in STEM. Saw (2020) argues that gaining social capital in STEM education through contextual influences such as family, peers, and educators, helps promote STEM education and STEM career pathways. Saw (2020) identified the ways in which one gains social capital in STEM, such as support from STEM teachers, receiving encouragement from people in STEM professions, and mentoring. The six women who participated in the STEM interview shared stories that drew upon experiences and people who contributed to their STEM social capital that also came from STEM teachers and from professionals in a STEM field.

Participants in my study noted that a benefit to attending a community college as the entry point into post-secondary education is that it provides an opportunity to gain practical skill

sets that can ease the transition into a four-year degree program. Allen et al. (2022) conducted a longitudinal qualitative study that explored the experiences of Black women in STEM pre-transfer. Allen et al. (2022) concluded that although none of their seven study participants were still in STEM majors three years after their initial interview, the researchers still felt that community colleges are positioned to aid in the success of diversifying STEM education and workforce. Allen et al. (2022) found that the experiences from community college can be positive and "offer a supportive environment" to assist in successful STEM student transfer (p. 18). Allen et al.'s (2022) study is one of few other studies that look at women of color in STEM pre-transfer experiences. My study on women of color in STEM and transfer is similar, as it is also a longitudinal study; however, my focus was on transfer experiences. Allen et al. (2022) considered the changes in attitude toward STEM in their findings. I found that different social interactions from community college and K-12 education added to the participants' capital that they were able to benefit from both in community college and post-transfer.

Researchers who have contributed to the scholarship on transfer experiences put value in understanding the role capital plays. Laanan et al. (2010) attributed transfer student capital to post-transfer adjustment. Laanan et al. (2010) studied the relevance of transfer student capital on adjustment and retention among transfer students. Laanan's (2007) hypothesis was the more transfer student capital a student has correlates to the probability of successful transfer. Crisp and Nunez (2014) suggested that there is a need for qualitative research to explore different forms of capital that support students.

Support networks, for example educators, family, and friends, played a role in transfer success in this study. Similar to prior research studies on STEM and transfer, I found that Educators in K-12 through community college can be a support network. In addition to support

from educations, other close people in the participants' lives provided different types of support that lead to capital gain. Support networks are examples of contextual influences on the participants.

Complexity and Capability of Identity Meaning-Making

My findings supported evidence that the consideration of social identities did inform experiences in STEM majors for women of color. I was able to explore this through the lens of the reconceptualized model of multiple dimensions of identity (RMMDI). Jones and McEwen (2000) developed a model of multiple dimensions of identity that placed personal characteristics and identity at the core of the model, and had context that included family, socioeconomic status, cultural conditions, and career decisions around the core. Abes and Jones (2004) added a meaning making capacity to the model. The meaning making capability is depicted as a filter, depending on the size of the openings of the filter depicts the complexity in the level that "context influences identity perceptions" (Abes et al., 2007, p. 6). Through the lens of RMMDI, my intention was to provide an understanding of how community college transfer women of color students in STEM majors "negotiate their multiple identities" and the distance of identity self-perceptions to the core identity (Abes & Kasch, 2007, p. 619). This longitudinal study exemplified that identity development and meaning-making is not always a linear pathway as prior constructivist-developmental theorists have previously argued (Abes & Kasch, 2007). Kegan's (1994) constructivist-developmental theory sees development as a somewhat straight trajectory and the way one makes meaning of their identities increases in complexity overtime. I found that the women in this study continued to negotiate their understanding of self-perception of identity and contextual influences. The complexity and capability of making-meaning of their

multiple identities ebbed and flowed between interviews; not always indicating a straight trajectory of an increased level of complexity between interviews.

Each woman articulated how context influenced how they perceived salient identity characteristics. Maya's parental influence on educational decisions challenged her own self-perception of being a woman in STEM throughout each interview. Even as Maya considers graduate school choices, the pull from her parents, her culture, and being an international student are prevalent in her choice to remain a statistics student. For Jill, the change in environmental context to a university helped facilitate her capability to understand her disability identity. She gained a better understanding of how to navigate this identity in the context of being a postsecondary student where she found resources available to her. Sara's language and gender self-identity perceptions were complex within the context of being an aviation major student. After transitioning out of the aviation major, Sara was left with continuing to have to make educational choices. She had time to reflect in hindsight on her experience in the aviation major and has shown complex understanding of her language identity. She articulated how others have projected their own negative ideas of her being bi-lingual throughout her educational journey, and how those prejudice beliefs will no longer be an influence on her educational choices.

Emma, Jane, and Liz each showed complexity in understanding their first-generation college student identity and contextual influence from family in their educational choices. Jane and Liz articulated the dichotomy of being both proud and celebrated, while also feeling pressure and not being understood by family. Similar to Liz and Jane, Emma continues to navigate her first-generation college student identity self-perception. For Emma, the encouragement of self-awareness infused in her courses has given her an opportunity to increase complexity in her identity meaning-making capability. This study was focused on transfer experiences, but the

consideration of identity and self-perceptions of identity further helped develop recommendations for future practice and research.

Implications and Conclusions

Laanan et al. (2010) described transfer students as "complex" and the transfer process as "multidimensional" (p. 177). In the past decade, there has been growing literature on transfer student adjustment, retention, and transfer agreements among community colleges and bachelor degree serving institutions. There has also been increasing interest in the role of community colleges in STEM education, and some specific literature (Allen et al., 2022; Packard et al., 2011; Reyes, 2011, 2012) on women of color, transfer, and STEM. Gaps are persistent though, and as the transfer process is "multidimensional" and transfer students are "complex," there is always space to continue to contribute to valuable research.

A post-intentional phenomenological methodology was chosen for the present study in part with the hopes that conducting this study would move beyond the analysis of understanding women of color's transfer experiences in STEM. Vagle's (2018) post-intentional phenomenological philosophy embraces not only understanding the shared essence of experience, but also addressing societal concerns to promote change. Through a constructivist paradigm, I wanted to understand the lived experiences of the participants (Mertens, 2020) and with that knowledge consider applicable practices that can support this student population. The findings indicated specific barriers and challenges that leave opportunity for post-secondary faculty and administrators to adjust approaches to address concerns. In this section, I have suggestions for faculty and advisors with the intention to better support this specific student population.

Recommendations for Future Practice

In this study, I examined transfer processes and decisions, and the role of social identities in educational choices and experience. For my recommendations, I have a recommendation for the current articulation agreement structure to improve credit mobility transparency for STEM majors in North Carolina. Additionally, I have a set of recommendations aimed at post-transfer institutions to better support women of color transfer students in STEM.

The participants in the study were all in a higher education institution within North Carolina at the time of the study. The context is relevant to understand because the impact of transfer credit mobility was significant, for better or worse depending on the major, among the women on the study. As a background, in 2014, North Carolina updated the Comprehensive Articulation Agreement (CAA) that included the assurance of associate-degree-earners admission from a community college into one of the 16 public universities in the state, and that 30 general education credits will transfer (D'Amico & Chapman, 2018). The state has since added additional baccalaureate degree plans (BDP) that are major and university specific, meaning that what one of the 16 universities decides to do in one major is not universal within the entire North Carolina university public system for the same major (D'Amico & Chapman, 2018). For pre-transfer students who are still exploring their post-transfer options, not having universal BDPs raise the chances of a surprise in excess credit or credit loss.

A recommendation I propose would be to have universal BDPs for more STEM majors. Community colleges offer a supportive environment for women of color entering into STEM majors (Allen et al., 2022; Rodriguez et al., 2016), but even with the optimal experience in STEM at community college, if there is unexpected loss of credits post-transfer, the outcomes may result in a loss of STEM retention post-transfer. D'Amico (2022) recommends an increase

in universal transfer pathways and believes this is viable, as it has already been achieved with some specific majors. I would recommend that universal transfer pathways increase for more STEM majors, with preference given to majors where there are significant variations between BDPs and for majors with high enrollments, for example computer science and biology. I argue that this should be a priority because of three factors. The first factor is that increasing the STEM workforce is a priority. Secondly, there is a need to diversify STEM, and community colleges are positioned to do that as they serve historically underrepresented in STEM student populations (Hagedorn & Purnamasari, 2012; Reyes, 2011). The third factor is that STEM education programs can be complex (Bahr et al, 2016) and minimizing confusion has potential to help with retention and bachelor degree graduation rates for women of color in STEM.

I have several recommendations for educators and higher education professionals to better support women of color transfer students in STEM majors. My recommendations are grounded in the findings of my study and supported by relevant literature. As a way to promote transfer success, retention in STEM majors, and graduation rates I suggest the colleges and departments focus on developing mentor programs, promote undergraduate research, and better equip student-facing faculty and staff to be aware and prepared to share knowledge on supports that relate to transfer adjustment and STEM for underrepresented groups.

My first recommendation for practice is increasing mentor programs for women of color in STEM and transfer students. My findings indicated that post-transfer students feel a lack of personal connection and encounter roadblocks that include credit loss and rigorous courses. At the same time, my findings also highlighted the positive impact of support networks and gave the women emotional, educational, and motivational support. Mentor programs are an additional type of support that STEM departments can offer that will facilitate expanding transfer students'

support networks (Reyes, 2011). Peer-to-peer mentoring is a form of support that connects students to each other. For transfer students, a benefit to peer-to-peer mentoring is that they would be connected to a student who has institutional knowledge that they could share. In addition to peer-to-peer mentor programs, I would also recommend professional mentor programs. For women of color to have the opportunity to see and talk with someone who shares identities, and is already in the workforce, that can be very impactful on the student.

My second recommendation is the promotion of undergraduate research. I found that transfer students felt behind post-transfer and at times did not feel sufficiently prepared. Over half of the participants in this study were first-generation-college students and shared that they had a limited number of family members to turn to for post-secondary education advice. For students in STEM, understanding how to get involved in research can be important to attain future goals, but there is a "hidden curriculum" (Sambell & McDowell, 2006, p. 391) in higher education that creates a barrier. As a way to counter feelings of not belonging or wanting to leave STEM, Reyes (2011) found being involved in undergraduate research encouraged persistence. Carlone and Johnson (2007) discovered that women of color participate in research, the probability of them persisting in STEM was higher. I recommend that departments make research opportunities clear to transfer students and historically underrepresented groups in STEM. An immediate way this can be done is announcing research opportunities in transfer orientations and transfer seminar courses. Additionally, departments can offer research open house events where current undergraduate students can share their undergraduate research experiences. I also recommend that colleges and departments promote diversity focused conferences, such as the Tapia conference, Anita Borg Grace Hopper Celebration, Society of Women Engineers National Conference, and SACNAS National Diversity in STEM Conference.

Providing some financial support for a limited number of students and faculty to attend diversity focused conferences promotes transmitting STEM capital, can provide women an opportunity to see others with shared identities also in STEM. Conference attendees can become ambassadors to the department to help bring in other women of color into research.

My last recommendation is to equip advisors, faculty, and staff with being aware of external and internal campus-wide events and initiatives for women of color and transfer students, and department level activities that are relevant to this population. The post-bachelor's institutions that the participants in this study attended varied in size and characteristics, but one commonality was the participants were not aware of, or participated in, many activities for women of color in STEM. Chen (2023) noted that higher education staff members are positioned to share resources about new social networks that are relevant, and that has a positive impact on transfer social adjustment. Universities often have affinity group clubs and organizations that are relevant and beneficial to a broad spectrum of students. Promoting these initiatives and events in public spaces around classrooms encourages an inclusive physical environment and is a way to communicate the opportunities with students.

There are also external opportunities for women of color in STEM that I recommend for both transfer sending and transfer receiving institutions to consider regularly as a best practice. The McNair Scholars Program is an example of a federally funded program that aims to support involvement in research for fist-generation and underrepresented groups in STEM (McNair Scholars, n.d.). The Louis Stokes Alliances for Minority Participation (LSAMP) is also a federal program with an overarching aim to increase underrepresented groups in STEM education. LSAMP has several projects to facilitate diversifying STEM education. For example, the Bridge to the Baccalaureate Alliance project under LSAMP has a focus on initiatives that are effective

in preparing educational opportunities for community college students from historically underrepresented groups in STEM to successfully transfer into bachelor's degree programs (NSF, n.d.).

In addition to basing my recommendations on my research study findings, I also found inspiration from Ong et al.'s (2017) identification of five types of counterspaces that promote belonging and combat feelings of isolation that women of color in STEM often experience. The five counterspaces types are: (1) peer-to-peer relationships, (2) mentoring relationships, (3) STEM and non-STEM campus groups, (4) diversity conferences, and (5) STEM departments (Ong et al., 2017).

Recommendations for Future Research

The study I conducted on women of color in STEM majors and navigating the transfer experience contributed to qualitative research on this subject. I believe that my study lends recommendations to future researchers who will add to understanding the lived experiences of women of color transfer students in STEM. I found that using RMMDI provided a guide to consider how individuals negotiate their multiple identities, make meaning of their identities, and how context influences their meaning-making capability. For future researchers, I would suggest expanding upon this. For example, Jones and McEwen (2000) asked participants in their study to map their own identities during a second interview. There is value in story-telling and hearing participants share their experiences, but asking participants to provide a visual to explore their self-perceptions of identity in a deliberate way adds additional data to examine. For future research, I would recommend researchers to design studies that add to research on social identities and how they inform educational choices.

An additional recommendation for future research would be for researchers to compare STEM experiences among different types of STEM majors. There are nuanced differences between the types of STEM majors and sub-cultures within each. Additional research on experiences in STEM majors where there is lower representation of women, has potential to lead to rich descriptions and insight as to how specific STEM departments can support their students.

Lastly, for future research, I would think about the methodology selected. Transfer student experiences have been studied by quantitative and qualitative researchers. Qualitative studies have contributed to understanding barriers, student experiences, and what institutions can do to increase successful transfer and close the gap between those with bachelor's degree intentions and those who do graduate with a bachelor's degree (Laanan, 2010). Quantitative studies examine institutional datasets and can consider student identity characteristics, view enrollment patterns, and academic performance (Laanan, 2010). For a future study, as a way to increase the robustness, a mix method methodological approach would be impactful to contributing to research inquires on women of color experiences as transfer students in STEM. Focusing on a specific STEM major, while bringing in quantitative data on retention and graduation outcomes of women of color in STEM majors, would provide a picture of transfer patterns and experience. Quantitative institutional data will also allow for the exploration on how many women enter a bachelor's in a STEM major, but change majors post-transfer.

Conclusion

Broadening the diversity within the STEM-workforce starts with education. Academic institutions are tasked with how to broaden participation in STEM. One viable option is through community colleges. As community colleges and bachelor serving institutions adjust current, and develop new, practices to recruit and retain women of color, there also needs to be continued

research. As a higher educational professional who works with STEM students, this study gave me the opportunity to consider practices and initiatives that are done in and outside of the classroom and consider their impact on the transfer student population. The study and the participants in the study also deepened my understanding of the importance of considering the multiple identities all students hold, and the varying context they are entering higher education from. Continued research on this population will continue to help inform best practices that post-secondary educators and professionals can implement to improve the academic success and feeling of belonging for women of color in STEM.

REFERENCES

Abes, E. S., & Jones, S. R. (2004). Meaning-making capacity and the dynamics of lesbian college students' multiple dimensions of identity. *Journal of College Student Development, 45*, 612-632. http://doi.org/10.1353/csd.2004.0065

Abes, E. S., Jones, S. R., & McEwen, M. K. (2007). Reconceptualizing the model of multiple dimensions of identity: The role of meaning-making capacity in the construction of multiple identities. *Journal of College Student Development, 48*(1), 1–22. https://doi.org/10.1353/csd.2007.0000

Abes, E.S., & Kasch, D. (2007). Using queer theory to explore lesbian college students' multiple dimensions of identity. *Journal of College Student Development 48*(6), 619-636. doi:10.1353/csd.2007.0069

Alexander-Floyd, N. G. (2012). Disappearing acts: Reclaiming intersectionality in the social sciences in a post-Black feminist era. *Feminist Formations, 24*(1), 1-25. https://www.jstor.org/stable/23275087

Allen, D., Dancy, M., Stearns, E., Mickelson, R., & Bottia, M. (2022). Racism, sexism and disconnection: Contrasting experiences of Black women in STEM before and after transfer from community college. *International Journal of STEM Education, 9*(20), https://doi.org/10.1186/s40594-022-00334-2

American Association of Community Colleges. (2017). *Fast facts 2017*. https://www.aacc.nche.edu/wp-content/uploads/2017/09/AACCFactSheet2017.pdf

Aragon, S. R., & Perez, M. R. (2006). Increasing retention and success of students of color at research-extensive universities. *New Directions for Student Services, 114,* 81-91. https://doi.org/10.1002/ss.209

Bahr, P. R., Jackson, G., McNaughtan, J., Oster, M., & Gross, J. (2016). Unrealized potential: Community college pathways to STEM baccalaureate degrees. *The Journal of Higher Education, 88*(3), 430-478. https://doi.org/10.1080/00221546.2016.1257313

Bahr, P. R., Jones, E. S., & Skiles, J. (2023). Investigating the viability of transfer pathways to STEM Degrees: Do community colleges prepare students for success in university STEM courses? *Community College Review*, *51*(4), 567-592. https://doi.org/10.1177/00915521231181955

Bahr, P. R., Toth, C., Thirolf, K., & Massi, J. C. (2013). A review and critique of the literature on community college students' transition processes and outcomes in four-year institutions. In Paulsen, M. B. (Ed.), *Higher education: Handbook of theory and research* (Vol 28, pp. 459-512). Springer. https://doi.org/10.1007/978-94-007-5836-0_10

Bahr, P. R. (2013). The deconstructive approach to understanding community college students' pathways and outcomes. *Community College Review*, *41*, 137–153. https://doi.org/10.1177%2F0091552113486341

Bailey, T. (2018). *Equity and guided pathways: Which practices help, which hurt, and what we don't know*. Community College Research Center, Teachers College, Columbia University. https://ccrc.tc.columbia.edu/~staging/media/k2/attachments/ccrc-currents-2018.pdf

Bailey, T., Jaggars, S. S., & Jenkins, D. (2015). *Redesigning America's community colleges: A clearer path to student success*. Harvard University Press.

Baker, R. (2016). The effects of structured transfer pathways in community colleges. *Educational Evaluation and Policy Analysis, 38*, 626-646. doi:10.3102/0162373716651491

Blackburn, H. (2017). The status of women in STEM in higher education: A review of the literature 2007-2017. *Science & Technology Libraries, 36*(3), 235-273. https://doi.org/10.1080/0194262X.2017.1371658

Bonham, K. S., & Stefan, M. I. (2017). Women are underrepresented in computational biology: An analysis of the scholarly literature in biology, computer science and computational biology. *PLoS Computational Biology, 13*(10). https://doi.org/10.1371/journal.pcbi.1005134

Bottia, M. C., Stearns, E., Mickelson, R. A., Moller, S., & Valentino, L. (2015). Growing the roots of STEM majors: Female math and science high school faculty and the participation of students in STEM. *Economics of Education Review, 45,* 14-27. http://doi:10.1016/j.econedurev.2015.01.002

Bowen, W. G., Chingos, M. M., & McPherson, M. S. (2009). *Crossing the finish line: Completing college at America's public universities*. Princeton University Press.

Brinkmann, S. (2018). The interviews. In N. Denzin, & Y. Lincoln, (Eds.) *Handbook of qualitative research* (5th ed.) (pp. 576-599). Thousand Oaks, CA: Sage.

Carbado, D. W. (2013). Colorblind intersectionality. *Journal of Women in Culture and Society, 38*(4), 811-845. https://doi.org/10.1086/669666

Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching, 44*(8), 1187–1218. https://doi.org/10.1002/tea.20237

Cejda, B. D. (2006). An examination of transfer shock in academic disciplines. *Community College Journal of Research and Practice, 21*(3), 279-288. https://doi.org/10.1080/1066892970210301

Chan, H. Y., & Wang, X. (2020). Reconciling intent with action: Factors associated with the alignment between transfer intent and coursework competition patterns among two-year college students in STEM. *The Journal of Higher Education, 91*(7), 1087-1115. https://doi.org/10.1080/00221546.2020.1740533

Chang, J. (2006). *Transfer adjustment experiences of underrepresented students of color in the sciences.* (Publication No. AA13247404) [Doctoral dissertation, University of California, Los Angeles]. ProQuest Dissertations and Theses. https://www.proquest.com/docview/305371372

Chen, Y. A. (2023). Social capital for vertical transfers: The multidimensional predictor of post-transfer adjustment and academic performance. *Journal of College Student Retention: Research, Theory & Practice,* 0(0). https://doi.org/10.1177/15210251231153990

Cohen, A. M., Brawer, F. B., & Kisker, C. B. (2014). *The American community college* (6th ed.). Jossey-Bass.

Collins, P. H., & Bilge, S. (2020). *Intersectionality* (2nd ed.). Polity Press.

Crenshaw, K. (1989). Demarginalizing the intersection of race and sex: Black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *University of Chicago Legal Forum, 1989,* 139-168.

Crisp, G., & Nuñez, A. (2014). Understanding the racial transfer gap: Modeling underrepresented minority and nonminority students' pathways from two-to four-year institutions. *The Review of Higher Education, 37,* 291-320. http://doi:10.1353/rhe.2014.0017

D'Amico, M. M. (2022). *North Carolina transfer enrollment patterns: A data snapshot*. The University of North Carolina at Charlotte. https://edld.charlotte.edu/wp-content/uploads/sites/307/2023/05/CLTRR-2022-4.pdf

D'Amico, M. M., & Chapman, L. (2018). *Community college to university transfer* [Policy Brief]. North Carolina: myFutureNC. https://www.myfuturenc.org/wp-content/uploads/2018/06/NEW-Policy-Brief-Univ-Transfer-DAmico-Chapman-PS.pdf

D'Amico, M. M., Chapman, L. M., & Robertson, S. (2021). Associates in applied science transfer and articulation an issue of access and equity. *Community College Journal of Research and Practice, 45*(5), 378-383. https://doi.org/10.1080/10668926.2020.1741477

Dawson, A. E., Bernstein, B. L., & Bekki, J. M. (2015). Providing the psychosocial benefits of mentoring to women in STEM: *Career*WISE as an online solution. *New Directions for Higher Education, 2015*(171), 53-62. https://doi.org/10.1002/he.20142

Dika, S., & D'Amico, M. (2016). Early experiences and integration in the persistence of first-generation college students in STEM and non-STEM majors. *Journal of Research in Science Teaching, 53*(3), 368-383. https://doi.org/10.1002/tea.21301

Dill, B. T. & Enid Zambrana, R. (2009). 1. Critical thinking about inequality: An emerging lens. In B. Dill & R. Zambrana (Eds.), *Emerging Intersections: Race, Class, and Gender in Theory, Policy, and Practice* (pp. 1-21). Rutgers University Press. https://doi.org/10.36019/9780813546513-003

Dinh, T. V., & Zhang, T. L. (2020). Engagement in high-impact practices and its influence on community college transfers' STEM degree attainment. *Community College Journal of Research and Practice, 45*(11), 834-849. https://doi.org/10.1080/10668926.2020.1824133

Elliott, D. C., & Lakin, J. M. (2020). Running the STEM gauntlet: The complicity of four-year universities in the transfer penalty. *Research in Higher Education, 61*(4), 540–565. http://dx.doi.org/10.1007/s11162-019-09586-4

Ferrini-Mundy, J. (2013). Driven by diversity. *Science Magazine, 340*(6130), 278. https://doi.org/10.1126/science.1235521

Fink, J., & Jenkins, D. (2017). Takes two to tango: Essential practices of highly effective transfer partnerships. *Community College Review, 45*(4), 294-310. https://doi.org/10.1177%2F0091552117724512

Goldhaber, D., Gross, B., & DeBurgomaster, S. (2008). *Community colleges and higher education: How do state transfer and articulation policies impact student pathways?* (CRPE Working Paper No. 2008-4). http://www.crpe.org/publications/community-colleges-and-higher-education-how-do-state-transfer-and-articulation-policies

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin, & Y. S. Lincoln (Eds.), The SAGE handbook of qualitative research (3rd ed., pp. 191-216). Sage.

Guiffrida, D. A., & Douthit, K. Z. (2010). The Black student experience at predominately white colleges: Implications for school and college counselors. *Journal of Counseling and Development, 88*(3), 311-318. https://doi.org/10.1002/j.1556-6678.2010.tb00027.x

Hagedorn, L. S., & Purnamasari, A. V. (2012). A realistic look at STEM and the role of community colleges. *Community College Review, 40*(2), 145-164. https://doi.org/10.1177%2F0091552112443701

Hagedorn, L. S., Moon, H. S., Cypers, S., Maxwell, W. E., & Lester, J. (2006). Transfer between community colleges and 4-year colleges: The all-American game. *Community College Journal of Research and Practice, 30*(3), 223-242. https://doi.org/10.1080/10668920500322384

Harris, J. C., & Patton, L. D. (2018). Un/doing intersectionality through higher education research. *The Journal of Higher Education, 90*(3), 347-372. https://doi.org/10.1080/00221546.2018.1536936

Hatch, D. K., & Garcia, C. E. (2017). Academic advising and the persistence intentions of community college students in their first weeks in college. *The Review of Higher Education, 40*(3), 353-390. http://doi.org/10.1353/rhe.2017.0012

Hernandez-Gantes, V., & Fletcher, E. C. (2013). The need for integrated workforce development systems to broaden the participation of underrepresented students in STEM related fields. In R. T. Palmer, & J. L. Wood (Eds.), *Community College and STEM: Examining Underrepresented Racial and Ethnic Minorities* (pp. 37-55). Routledge.

Herrera, A., & Jain, D. (2013). Building a transfer-receptive culture at four-year institutions. *New Directions for Higher Education, 162*, 51-59. https://doi.org/10.1002/he.20056

Hills, J. R. (1965). Transfer shock, *The Journal of Experimental Education, 33*(3), 201-215. http://www.jstor.org/stable/20156766

Hodara, M., Martinez-Wenzl, M. M., Stevens, D., & Mazzeo, C. (2017). Exploring credit mobility and major-specific pathways: A policy analysis and student perspective on community college transfer. *Community College Review, 45*(44), 331-349. https://doi.org/10.1177%2F0091552117724197

Hoyt, J. E., & Winn, B. A. (2004). Understanding retention and college student bodies: Differences between drop-outs, stop-outs, opt-outs, and transfer-outs. *NASPA Journal, 41*(3), 395-417. https://doi.org/10.2202/1949-6605.1351

Hu, X., & Ortagus, J. C. (2019). A national study of the influence of the community college pathway on female students' STEM baccalaureate success. *Community College Review, 47*(3), 242-273. https://doi.org/10.1177%2F0091552119850321

Ignash, J. M., & Townsend, B. K. (2000). Evaluating state-level articulation agreements according to good practice. *Community College Review,* 28(3), 1-21. https://doi.org/10.1177%2F009155210002800301

Jabbar, H., Serrata, C., Epstein, E., & Sanchez, J. (2017). "*Echale ganas*": Family support of Latino/a community college students' transfer to four-year universities. *Journal of Latinos and Education, 18*(3), 258-276. https://doi.org/10.1080/15348431.2017.1390462

Jackson, D. J. (2013). Making the connection: The impact of support systems on female transfer students in science, technology, engineering, and mathematics (STEM). *The Community College Enterprise*, *19*(1), 19-33. https://home.schoolcraft.edu/cce/19.1.19-33.pdf

Jackson, D. L., & Laanan, F. S. (2015). Desiring to fit: Fostering the success of community college transfer students in STEM. *Community College Journal of Research and Practice. 39*(2), 132-149. https://doi.org/10.1080/10668926.2012.762565

Jackson, D. L., Starobin, S. S., & Laanan, F. S. (2013). The shared experiences: Facilitating successful transfer of women and underrepresented minorities in STEM fields. *New Directions for Higher Education, 162,* 69-76. https://doi.org/10.1002/he.20058

Jain, D., Bernal, S., Lucero, I., Herrera, A., & Solorzano, D. (2016). Towards a critical race perspective of transfer: An exploration of a transfer receptive culture. *Community College Journal of Research and Practice, 40*, 1013-1024. http://doi:10.1080/10668926.2016.1213674

Jain, D., Herrera, A., Bernal, S., & Solorzano, D. (2011). Critical race theory and the transfer function: Introducing a transfer receptive culture. *Community College Journal of Research and Practice, 35*(3), 252-266. https://doi.org/10.1080/10668926.2011.526525

Jenkins, D., & Fink, J. (2015*). What we know about transfer*. Columbia University, Teachers College, Community College Research Center. https://doi.org/10.7916/D8ZG6R55

Jenkins, D., & Fink, J. (2016). *Tracking transfer new measures of institutional and state effectiveness in helping community college students attain bachelor's degrees*. Community College Research Center, Teachers College, Columbia University. https://ccrc.tc.columbia.edu/ media/k2/attachments/tracking-transferinstitutional-state-effectiveness.pdf

Jenkins, D., Lahr, H., Fink, J., & Ganga, E. (2018). *What we are learning about guided pathways. Part 1: A reform moves from theory to practice*. Columbia University, Teachers College, Community College Research Center. https://ccrc.tc.columbia.edu/media/k2/attachments/guided-pathways-part-1-theory-practice.pdf

Jenkins, R. (2014). *Social Identity* (4th ed.). Routledge.

Johnson, A., Brown, J., Carlone, H., & Cuevas, A. K. (2011). Authoring identity amidst the treacherous terrain of science: A multiracial feminist examination of the journeys of three women of color in science. *The Journal of Research in Science Teaching, 48*(4), 337-436. https://doi.org/10.1002/tea.20411

Johnson, D. R. (2012). Campus racial climate perceptions and overall sense of belonging among racially diverse women in STEM majors. *Journal of College Student Development, 53*(2), 336–346. http://doi:10.1353/csd.2012.0028

Jones, S. R., & McEwen, M. K. (2000). A conceptual model of multiple dimensions of identity. *Journal of College Student Development, 41*(4), 405-414.

Kahlenberg, R. D., Shireman, R., Quick, K., & Habash, T. (2018). *Policy strategies for pursing adequate funding of community colleges*. The Century Foundation. https://tcf.org/content/report/policy-strategies-pursuing-adequate-funding-community-colleges/?agreed=1

Kegan, R. (1994). *In over our heads: The mental demands of modern life*. Harvard University press.

Kisker, C. B. (2007). Creating and sustaining community college-university transfer partnerships. *Community College Review, 34,* 282-301. https://doi.org/10.1177/0091552107300333

Kujawa, T. A. (2013). The AAS to BAS pathway: Heating up the educational aspiration of CTE students. *Community College Journal of Research and Practice, 37*(5), 356-364. https://doi.org/10.1080/10668926.2012.755648

Laanan, F. S. (2007). Studying transfer students: Part II: Dimensions of transfer students' adjustment. *Community College Journal of Research and Practice, 31*, 37-59. https://doi.org/10.1080/10668920600859947

Laanan, F. S., Starobin, S. S., & Eggleston, L. E. (2010). Adjustment of community college students at four-year university: Role and relevance of transfer student capital for student retention. *Journal of College Student Retention: Research, Theory & Practice, 12*(2), 175-209. https://doi.org/10.2190%2FCS.12.2.d

Lincoln, Y. S., & Guba, E. (1985). *Naturalistic inquiry*. Sage.

London, H. B. (1989). Breaking away: A study of first-generation college students and their families. *American Journal of Education*, *97*(2), 144-170.

Lopez, C., & Jones, S. J. (2017). Examination of factors that predict academic adjustment and success of community college transfer students in STEM at 4-year institutions. *Community College Journal of Research and Practice, 41*(3), 168-182. https://doi.org/10.1080/10668926.2016.1168328

Ma, J., & Baum, S. (2016). *Trends in community colleges: Enrollment, prices, student debt, and completion*. The College Board. https://research.collegeboard.org/pdf/trends-community-colleges-research-brief.pdf

Malcom, L. (2010). Charting the pathways to STEM for Latina/o students: The role of community colleges. *New Directions for Institutional Research, 148*, 29-40. https://doi.org/10.1002/ir.359

Malcom, S. M., Hall, P. Q., & Brown, J. W. (1976). *The double bind: The price of being a minority woman in science* (No. 76-R-3). American Association for the Advancement of Science. http://archives.aaas.org/docs/1975-Double%20Bind.pdf

Manly, C. A., Wells, R., S, & Kommers, S. (2018). The influence of STEM definitions for research on women's college attainment. *International Journal of STEM Education. 18*. https://doi.org/10.1186/s40594-018-0144-1

Martinez-Wenzl, M., & Marquez, R. (2012). Unrealized promises: Unequal access, affordability, and excellence at community colleges in Southern California. *UCLA: The Civil Rights Project/Proyecto Derechos Civiles*. https://escholarship.org/uc/item/23c5m52j

McNair Scholars Program. (n.d.). *Read about*. https://mcnairscholars.com/about/

Melguizo, T., Kienzl, G., & Alfonso, M. (2011). Comparing the educational attainment of community college transfer students and four-year college rising juniors using propensity score matching methods. *Journal of Higher Education, 82*(3), 265-291. https://doi.org/10.1080/00221546.2011.11777202

Merriam, S. & Tisdell, E. J. (2014). Chapters 2 & 3. In *Qualitative research: A guide to design and implementation* (4th ed.) (pp. 23-72). Jossey-Bass.

Mertens, D. M. (2020). *Research and evaluation in education and psychology* (5th ed.). Sage.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods source book* (3rd ed.). Sage.

Monaghan, D. B., & Attewell, P. (2015). The community college route to the bachelor degree. *Educational Evaluation and Policy Analysis, 37*(1), 70-91. https://doi.org/10.3102%2F0162373714521865

Montague, N. R. (2012). Articulation agreements: No credit left behind. *Issues in Accounting Education, 27*(1), 281-298. https://doi.org/10.2308/iace-10218

Morton, T. R., & Parsons, E. C. (2018). #BlackGirlMagic: The identity conceptualization of Black women in undergraduate STEM education. *Science Education, 102*(6), 1363-1393. https://doi.org/10.1002/sce.21477

Nash, J. C. (2008). Re-thinking intersectionality. *Feminist Review, 89*(1), 1-15. https://doi.org/10.1057%2Ffr.2008.4

National Science Foundation [NSF]. (n.d.). Louis Stokes alliances for minority participation (LSAMP). https://new.nsf.gov/funding/opportunities/louis-stokes-alliances-minority-participation

National Science Foundation [NSF]. (2015). *Revisiting the STEM workforce: A companion to science and engineering indicators 2014.* https://www.nsf.gov/pubs/2015/nsb201510/nsb201510.pdf

National Science Foundation [NSF]. (2019). *Women, minorities, and persons with disabilities in science and engineering*. https://ncses.nsf.gov/pubs/nsf19304/digest

National Student Clearinghouse. (2015). *Snapshot report: Contribution of two-year institutions to four-year completions.* https://nscresearchcenter.org/wp-content/uploads/SnapshotReport17-2YearContributions.pdf

Ong, M., Smith, J. M., & Ko, L. T. (2017). Counterspaces for women of color in STEM higher education: Marginal and central spaces for persistence and success. *Journal of Research in Science Teaching, 55*(2), 206-245. https://doi.org/10.1002/tea.21417

Ong, M., Wright, C., Espinosa, L. L., & Orfield, G. (2011). Inside the double bind: A synthesis of empirical research on undergraduate and graduate women of color in science, technology, engineering, and mathematics. *Harvard Educational Review, 81*(2), 172–209. http://doi:10.17763/haer.81.2.t022245n7x4752v2

Packard, B., Gagnon, J., LaBelle, O., Jeffers, K., & Lynn, E. (2011). Women's experiences in STEM community college transfer pathway. *Journal of Women and Minorities in Science and Engineering, 17*(2), 129-147. http://doi:10.1615/JWomenMinorScienEng.v17.i2

Rainey, K., Dancy, M., Mickelson, R., Stearns, E., & Moller, S. (2018). Race and gender differences in how sense of belonging influences decisions to major in STEM. *International Journal of STEM Education*, *5*, 10. https://doi.org/10.1186/s40594-018-0115-6

Reyes, M. E. (2012). Increasing diversity in STEM by attracting community college women of color. In B. Bogue & E. Cady (Eds.), *Apply Research to Practice (ARP) Resources*. http://aweonline.org/arp_womenofcolorcommunity@20college_abstract@20final.pdf

Reyes, M. E. (2011). Unique challenges for women of color in STEM transferring from community colleges to universities. *Harvard Educational Review, 81*(2), 241–263. https://doi.org/10.17763/haer.81.2.324m5t1535026g76

Rockinson-Szapkiw, A., Wendt, J. L., & Stephen, J. S. (2021). The efficacy of a blended peer mentoring experience for racial and ethnic minority women in STEM pilot study: Academic, professional, and psychosocial outcomes for mentors and mentees. *Journal for STEM Education Research, 4*, 175-193. https://doi.org/10.1007/s41979-020-00048-6

Rodriguez, S. L., Cumingham, K., & Jordan, A. (2016). What a scientist looks like: How community colleges can utilize and enhance science identity development as a means to improve success for women of color. *Community College of Journal of Research and Practice, 41*(4-5), 232-238. https://doi.org/10.1080/10668926.2016.1251354

Saldana, J. (2021). *The coding manual for qualitative researchers* (4th ed.). Sage.

Sambell, K., & McDowell, L. (2006). The construction of the hidden curriculum: Messages and meanings in the assessment of student learning. *Assessment & Evaluation in Higher Education, 23*(4), 391-402. https://doi.org/10.1080/0260293980230406

Saw, G. K. (2020). Leveraging social capital to broaden participation in STEM. *Policy Insights from the Behavioral and Brain Sciences, 7*(1), 35-43. https://doi.org/10.1177/2372732219895997

Schudde, L., & Goldrick-Rab, S. (2015). On second chances and stratification: How sociologists think about community colleges. *Community College Review, 43*(1), 27-45. https://doi.org/10.1177/0091552114553296

Shapiro, D., Dundar, A., Huie, F., Wakhungu, P. K., Bhimdiwala, A., & Wilson, S. E. (2018). *Completing college: A national view of student completion rates- Fall 2012 cohort* (Signature Report 16). National Student Clearinghouse Research Center. https://nscresearchcenter.org/wp-content/uploads/SignatureReport16.pdf

Shapiro, D., Dundar, A., Huie, F., Wakhungu, P. K., Yuan, X, Nathan, A., & Hwang, Y. (2017). *Tracking transfer: Measures of effectiveness in helping community college students to complete bachelor's degrees* (Signature Report No. 13). National Student Clearinghouse Research Center. https://nscresearchcenter.org/wp-content/uploads/SignatureReport13_corrected.pdf

Shapiro, D., Dundar, A., Ziskin, M., Chiang, Y.-C., Chen, J., Harrell, A., & Torres, V. (2013). *Baccalaureate attainment: A national view of the postsecondary outcomes of students who transfer from two-year to four-year institutions*. National Student Clearinghouse Research Center. http://nscresearchcenter.org/wp-content/uploads/SignatureReport5.pdf

Shaw, S. T., Spink, K., & Chin-Newman, C. (2019). “Do I really belong here?”: The stigma of being a community college transfer student at a four-year university. Community College Journal of Research and Practice, 43(9), 657-660. https://doi.org/10.1080/10668926.2018.1528907

Solorzano, D., Ceja, M., & Yosso, T. (2000). Critical race theory, racial microaggressions, and campus racial climate: The experiences of African American college students. *The Journal of Negro Education, 69*(1), 60-73. https://www.jstor.org/stable/2696265

State Board of Community Colleges & Board of Governors of the University of North Carolina. (2015). *Report on study of bilateral agreements and partnerships that exist between constituent institutions of the North Carolina Community Colleges and constituent institutions of the University of North Carolina*. Raleigh and Chapel Hill, NC: Author. https://www.northcarolina.edu/sites/default/files/final_report_sb_744_bilateral_agreements_1-29-15-3.pdf

Taylor, J. L., & Jain, D. (2017). The multiple dimensions of transfer: Examining the transfer function in American higher education. *Community College Review, 45*(4), 273-293. https://doi.org/10.1177%2F0091552117725177

Taylor, Z. W. (2017). Inarticulate transfer: Do community college students understand articulation agreements? *Community College Journal of Research and Practice, 42*(1), 65-69. https://doi.org/10.1080/10668926.2017.1382400

The Almanac. (2020, August 16). *Graduation rates for transfer-in students starting in 2010-11.* The Chronicle of Higher Education. https://www.chronicle.com/article/graduation-rates-for-transfer-in-students-starting-in-2010-11?cid=gen_sign_in

Tomaszewski, L. E., Zarestky, J., & Gonzalez, E. (2020). Planning qualitative research: Design and decision making for new researchers. *International Journal of Qualitative Methods, 19*, 1-7. https://doi.org/10.1177%2F1609406920967174

Townsend, B. K. (2001). Redefining the community college transfer mission. *Community College Review, 29*(1), 29-42. https://doi.org/10.1177%2F009155210102900203

Trapani, J., & Hale, K. (2019). *Higher education in science and engineering: Science and engineering indicators 2020* [NSB-2019-7]. National Science Foundation.

Turk, J. (2019, June 26). *Erasing the community college stigma*. Higher Education Today. https://www.higheredtoday.org/2019/06/26/erasing-community-collegestigma/

Vagle, M. D. (2018). *Crafting phenomenological research* (2nd ed.). Routledge.

Valenzuela, Y. (2006). *Mi fuerza/My strength: The academic and personal experiences of Chicana/ Latina transfer students in math and science*. (Publication No. AA13243278) [Doctoral dissertation, University of California, Irvine, and University of California, Los Angeles]. ProQuest Dissertations and Theses. https://www.proquest.com/docview/304916976

Wang, M., & Degol, J. L. (2017). Gender gap in science, technology, engineering, and mathematics (STEM): Current knowledge, implications for practice, policy and future directions. *Educational Psychology Review, 29,* 119-140. https://doi.org/10.1007/s10648-015-9355-x

Wang, X. (2017). Upward transfer in STEM fields of study: A new conceptual framework and survey instrument for institutional research. *New Directions for Institutional Research, 170,* 49-60. https://doi.org/10.1002/ir.20184

Wang, X. (2020). *On my own: The challenges and promise of building equitable STEM transfer pathways*. Harvard Education Press.

Wang, X., Lee, S. Y., Nachman, B. R., & Zhu, X. (2021). It matters long before: How early exposure to faculty and advisors at baccalaureate institutions relates to upward transfer. *Educational Researcher, 50*(2)*,* 105-114. https://doi.org/10.3102%2F0013189X20956659

Wang, X. (2013). Community college and underrepresented racial and ethnic minorities in STEM education. In R. T. Palmer & J. L. Wood (Eds.), *Community colleges and STEM* (pp. 3–16). Taylor & Francis.

Wang, X. (2015). Pathway to a baccalaureate in STEM fields: Are community colleges a viable route and does early STEM momentum matter? *Educational Evaluation and Policy Analysis, 37*(3), 376–393. https://doi.org/10.3102%2F0162373714552561

Williams, E. N., & Morrow, S. L. (2009). Achieving trustworthiness in qualitative research: A pan-paradigmatic perspective. *Psychotherapy Research, 19*(4-5), 576-582. https://doi.org/10.1080/10503300802702113

Wood, J. L., Nevarez, C., & Hilton, A. (2011). Creating a culture of transfer. *Making Connections, 13*(1), 54-61. https://www.proquest.com/scholarly-journals/creating-culture-transfer/docview/928084014/se-2?accountid=14605

Wyner, J., Deane, K. C., Jenkins, D., & Fink, J. (2016). *The transfer playbook: Essential practices for two- and four-year colleges*. Aspen Institute. https://files.eric.ed.gov/fulltext/ED565894.pdf

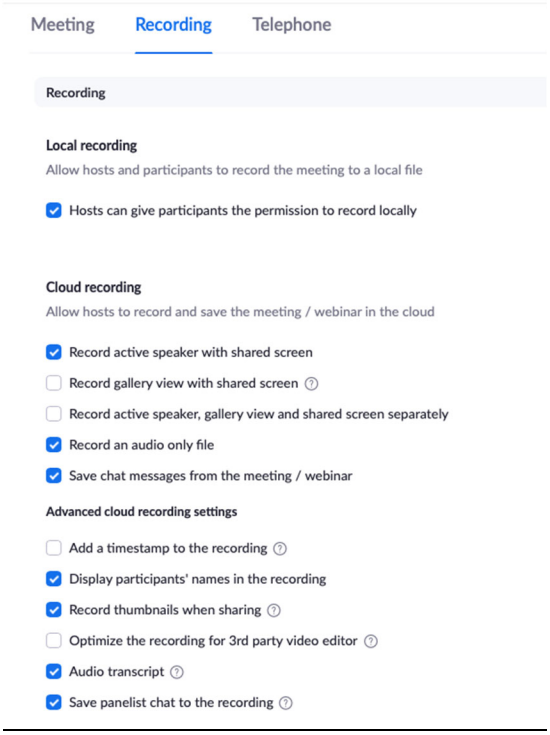
Zhang, Y. L. (2019). Early academic momentum: Factors contributing to community college transfer students' STEM degree attainment. *Journal of College Student Retention: Research, Theory & Practice, 23*(4), 873-902. https://doi.org/10.1177%2F1521025119881130

APPENDIX: STEM INTERVIEW PROTOCOL

Qualitative Study of North Carolina Transfer Students

Women of Color in STEM: Navigating the Transfer Process (Dissertation)

Before the interview – Set Zoom recording settings on uncc.zoom.us and ensure that the following two boxes are checked in the recording menu: "Record an audio only file" and "Audio transcript." **When in the meeting—Record to the Cloud.**



Introduction

Thank you again for agreeing to participate in this interview. Before we get started, I want to tell you a little bit about my research topic and why I asked if you could participate. I'm a 3rd year graduate student in an Educational Leadership doctoral program. I am one of the researchers in the larger qualitative study that you have participated in, but as a student I am conducting my own research that is specific to the experiences of women of color transfer students in STEM majors. For this interview, I'm interested in talking about experiences that are specific to STEM and talk more about identities that you identify as important.

- This interview should last about 45-60 minutes, but could take up to an hour and a half depending on the length of your responses. What time do you need to stop by today? If you want to take a break at any point, just let me know.
- As mentioned in the consent form, I'm going to record this interview so I can make sure to capture your words accurately. Your real name will not be included on the final interview transcript or in any data analysis. After the recording is complete, I will delete

the file that contains video and audio; I will then have the audio only file professionally transcribed. After the interview is transcribed, I will email you a copy of the transcript, and you are welcome to review it and note any changes or corrections that need to be made.

- Some questions around social identities and your educational background may be familiar from your first interview, but this interview will largely focus on your experiences specific to being a STEM major. I'll also be asking you to think about and discuss the intersections of some of your identities and how they connect to you being a STEM student.
- Your privacy and confidentiality are very important to me. Please keep in mind that you can skip any question if you'd like, or stop participating in this study at any time. If you'd like to elaborate on any of your answers, please do. I may ask follow up questions as well. Do you have any questions before we get started?
- I will now begin recording our conversation. **(NOTE: Record to the Cloud.)**

Background on interest in STEM

1. Can you tell me about how you got interested in studying (insert major)?
   Probe: Was this something you had interest in during middle/high school?
   Probe: *Post-transfer students*: Did you study this major while at community college?
2. Going back to your K-12 education, could you tell me about a time you had a positive experience in a science or math course?
3. Can you tell me about a time when you had a challenging or negative experience in a science or math course during K-12?
   Probe: How would you say these experiences had an impact on your major decision?
4. Who are some people in your life who have been significant in your educational journey as a STEM major?
   Examples: Parents, family, friends, teachers, advisors, a mentor

Social identities

I'd like to revisit the conversation we had on identities from your first interview. Specifically, I'd like to hear your thoughts on how identities, for example being a woman, your race, or socioeconomic status impact you as a STEM student.

5. Could you tell me about your identities and their importance to you?
   a. Example identities include: Being a woman, your race, socioeconomic status, first-generation college student, being a mother, etc.
   b. Probe for first-generation college student: First generation college students are students with neither parent obtaining a four-year degree. Can you speak about how that status has impacted your college journey?
6. Tell me about how (if) any of these identities connect to your experiences as a (fill in the blank) major?
7. *Community college student*: As a current community college student who plans to transfer into a four-year school, how have your identities impacted the process so far?

Four-year student: As a student who has gone through the transfer process, how did any of your identities impact that process?

8. Socioeconomic status can be measured by economic and social factors, such as family income, parental education levels and occupations. Could you describe your socioeconomic status?
    a. Probe: Pell eligibility and/or use of financial aid
       Probe: Do financial aspirations inform any of you major or future career choices?

Classroom experiences

As we continue the interview and move into discussing classroom experiences, I invite you to tell me about any experiences that are connected to any of these identities you have mentioned.

9. Can you tell about your experience in STEM classes while at (fill in the blank) community college?
10. *Current four-year student only:* Can you tell me about the classes you are taking or have taken since being at (fill in the blank)?
11. Thinking about the identities you've identified as important to you, could you talk about how some of those identities come up in your classes?
    a. Would you say that you share similar identities with other students in your classes?
12. What are the differences you've experienced in your major classes verses your more general education classes?
    a. Examples can include class size, course work demand
13. What are some challenges you have experienced in your major classes?
    a. Could you describe how (if) racism and sexism have come up in your classes or research?
    a. Do you find any of these challenges connected to being a transfer student, or a student with transfer intent?
14. Could you talk about support systems that have been important to you?
    a. Are the supports through organized activities such as student organizations/study sessions, or more informal gatherings?
    b. Are there STEM supports available for you?
    c. Are there support systems with other women with similar identities?
15. Could you talk about any experiences you have had with a mentor? Someone who has helped you navigate being a college student, or a woman of color in a STEM major.
16. Could you tell me about a time you have a really good experience as a (fill in the blank) major?
    a. Probe: Is there a connection between a social identity and that experience.
17. Could you tell me about a time where maybe you did not have such a good experience as a (fill in the blank major)?
    a. Probe: Is there a connection between a social identity and that experience.

Advice and closing

18. Thinking about everything we just covered, how would you describe your overall experience as a woman of color in STEM who has experienced the transfer process?

19. What advice would you give to other women of color pursing transfer into a STEM major?
20. What advice would you give to educators working with students who transfer into STEM majors?
21. Is there anything we missed or didn't cover earlier that you would like to share?