A Mixed Methods Study of Transfer Students' Perceptions of an Undergraduate Summer Research Program: Exploring the Relationships Between the Program and Students' Science-Related Beliefs and Effort in the Program

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ABSTRACT

Community college students who transfer to a bachelor's degree granting institution to complete degrees in science often change majors before graduation. Limited research is available on institutional support programs that target this specific population and how programs such as summer research and academic enrichment might increase their motivation to study and persist in a science major. The present study examined the relationship between participants' perceptions of their experience in a summer research program and their motivation to persist in science-related majors and career paths. Participants were community college students with an interest in pursuing a science major and career at the host university. All participants completed a 10-week residential summer apprenticeship-style research program. Participants completed pre- and post-surveys before voluntarily participating in a semi-structured interview that utilized questions adapted from the MUSIC Model of Academic Motivation Inventory. The findings demonstrate the relationship between program features and participants' science-related self-efficacy, science identification, science-related goals, and effort.

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GENERAL AUDIENCE ABSTRACT

This study explored the relationship between community college students' experiences in a summer research program and their decisions about science-related academic and career goals. Participants were enrolled in a ten-week summer research and academic enrichment program at a research university. Each participant was assigned a faculty mentor for the duration of the program. The findings suggest that certain features of the program were related to participants' goals in science.

Dedication

I finished this long journey and dedicate its outcome to my dad who will always be my guardian angel and inspiration--in life and in death. Always the proud Dad, he encouraged me every step of the way until he passed a few days before my preliminary exam. I wanted to stop this process there, but I pushed on. I still miss his smile and the sound of his calming voice encouraging me to push through whatever challenges I faced. In the spirit of knowing how proud Dad would be that I finished what I started, I dedicate this dissertation in memory of my father, George Halsey, Sr.

"Our lives are defined by opportunities, even the ones we miss." F. Scott Fitzgerald

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Chapter 1: Introduction to the Study

First-year experience (FYE) programs have been shown to have a collective purpose of providing newly enrolled students access to the institutional and personal resources needed to help them adapt to the college environment (Pascarella & Terenzini, 2005). As adopted and adapted by institutions today, these programs are not new and can be traced back hundreds of years (Fitts & Swift, 1928). First-year programs have been shown to be effective for traditional students (Eggleston & Laanan, 2001); yet, less is known about whether this type of programming is a good fit for all students, especially community college students who transfer to universities in science, technology, engineering, and mathematics (STEM) majors. A closer look at this subgroup of transfer students identifies students who are considered at risk for attrition, including older students, first-generation students, and those considered underrepresented or underserved, so it is important to understand what types of transitional programming is most effective in meeting their needs.

As the national conversation about the need for more STEM majors from underrepresented populations continues, community college remains an important pathway to four-year institutions for some students (American Association of Community Colleges, 2017). Creating and strengthening partnerships between community colleges and public universities is one approach that has gained popularity in the last few years (Association of Public Land-Grant Universities, 2016).

Retention and persistence rates of students at the university remain a point of concern and university leaders routinely explore strategies to retain students, including ways to enhance FYE programming, which was designed to support newly admitted students transitioning from high school to college. Despite these efforts, the persistence and retention rates remain fairly consistent. According to figures from the 2015 National Student Clearinghouse Research Center ("Snapshot"), students who began college in fall 2015 persisted at a rate of 73.4 percent with 61.1 percent remaining at the same institution for a second year.

Numerous reports have shown that retention of underrepresented groups who begin their college studies at the community college before later transferring to four-year institutions is problematic. Students who transfer from community college to the university in pursuit of a STEM degree are historically more likely to change to a non-STEM major before graduation (Anderson & Kim, 2006; Elliott, Strenta, Adair, Matier, & Scott, 1996; Tsui, 2007; U. S. Department of Education, 2000).

What are areas of concerns noted by transfer students who transfer to a four-year institution? Some researchers have indicated a lack of structured faculty mentoring and institutional engagement, among other concerns (Allen, 1992; Brown, 2000; Cole, 2007; May & Chubin, 2003; Tsui, 2007). Although transition programs are designed primarily to help students transition successfully from high school to college, a less studied question is whether such transition programs are helpful to motivate students who enter STEM majors at a university through transfer pathways from community college to persist at the university after transfer.

Transition programs, including FYE programs, vary in programmatic focus and duration. Determining the program elements that are most beneficial for a particular population requires a closer look at the individual student to determine what will give him or her the greatest chance to succeed. It is important to understand how this group fits into the dominant culture of the institution and selected major, which leads to the question: Are there specific transition program components that have been shown to help certain populations of students transition and persist at a university and in a science-related majors?

Traditional students and those who enter the university directly from high school have more in common as a group than students who transfer to the university after attending community college. This is due in part to the diverse backgrounds of students who transfer from community college to four-year institutions. The open admission framework, low tuition, and local access of the community college means that more underrepresented and underserved students are able to earn college credits before transferring to the university to continue their studies. A 2015 National Student Clearing House report based on students completing degrees at a four-year institution in 2013-14 indicated that 46% of graduates attended a community college at some time in the process. The report further projects that undergraduate enrollment at 2-year colleges will climb upward from 6.5 million students to 7.8 million students by 2026 (a 21% increase), with a significant percentage of those students identifying as underrepresented and underserved.

Statement of the Problem

Research on the first-year experience of traditional students continues to increase. A search of the SUMMONS database for dissertations written within the past 10 years, and then a second search for those written within the last three years, using the limiting phrase "first-year university experience and traditional college students" returned 9,125 and 4,220 results respectively. However, a similar search using the subject "first-year university experiences and community college transfer students" yielded 1,784 results. The body of research related to the transition and persistence to degree experience of community college transfer students who participate in any type of pre- or post-transfer apprenticeship-style programs is still very limited in comparison with research on the traditional incoming student who enters college directly after high school. The overall goal of this study is to add to the body of knowledge that explores student experiences in programs designed to motivate students to persist in a specific major and career pathway after transfer.

Purpose of the Study

The purpose of this study was to investigate the relationship between the experiences and motivational beliefs of community college transfer students who participated in a summer scientific research experience at the university where they planned to then enroll and complete their bachelor's degree. The significance of studying this phenomenon was to offer insight into factors that motivated students during the summer program and after, as they consider science-related career choices.

This study examined community college transfer student outcomes through the lens of a motivation model. The information gained can be utilized to further refine instructional components of the existing program. I explored the relationship between a pre-transfer summer bridge program on students' science-related self-efficacy, science identification, and science-related goals at the university. In exploring the first-year university experience, I examined theories related to transitions and student development, identified types of college transition programs, including those with a major or career specific focus. Finally, I explored theories specifically related to undergraduate research and student motivation, which helped to shape the need for the study.

Although studies on the community college transfer student population post-transfer are available, many existing studies utilized quantitative methods and analyses of first-semester GPA, completion rates, and overall first-year experiences in comparison to traditional students at the same academic level (Pascarella & Terenzini, 2005). Additionally, Bahr et al. (2013) noted that much of the literature on this population treats the different subpopulations the same.

Qualitative research on program-specific outcomes for transition programs which target underrepresented and underserved students exist, yet additional qualitative institution-specific studies that seek to identify best practices in programming that targets community college students who plan to and eventually transfer into a STEM major could further bridge this gap in the literature. Therefore, this study sought to determine the relationship between programmatic instructional strategies on community college transfer student behaviors and outcomes related to motivation and identification with science. The results of this study can be used by directors of similar programs to determine the types of instructional strategies work best to motivate students to remain in a science major.

Research Questions

The two specific research questions that drove the study are as follows:

1. What relationships exist between a summer research program for community college transfer students and these students' science-related self-efficacy, science identification, and science-related goals?
2. How do community college transfer students' perceptions of a summer research program affect their effort in the program?

Definition of Terms

For the purpose of this study, I used the definitions provided here.

Science in Transition program: This summer program was designed to introduce current and recently-graduated community college students to the work of researchers through campus lectures and hands-on lab activities. The goal of the project was to motivate underrepresented students to pursue advanced degrees in a biomedical or life science major at the hosting institution. Funding for the research program was provided by the National Institute of Health.

Community college transfer student: Student who plans to enroll at a four-year university after completing credit hours or a transfer degree at a two-year college.

First-generation student: Student who is first in the family to attend a four-year college/university.

Persistence: Continued enrollment at any institution until academic goal achievement.

Retention: Continued enrollment at the same institution until degree completion.

Traditional student: Student entering the university directly from high school.

Underrepresented students:

- Individuals from racial and ethnic groups shown to be underrepresented in biomedical research including Blacks or African Americans, Hispanics or Latinos, American Indians or Alaska Natives, and Native Hawaiians and other Pacific Islanders;
- Individuals with disabilities, defined as those with a physical or mental impairment that substantially limits one or more major life activities; and
- Individuals from disadvantaged backgrounds, defined as those from a family with an annual income below established low-income thresholds and those who come from an educational environment that has inhibited the individual from obtaining the knowledge, skills, and abilities necessary to develop and participate in a research career (NIH-Grant Proposal).

Chapter 2: Review of the Literature

This review of the literature includes an overview of student development theories related to student transitions, retention, and attrition; undergraduate research; and student motivation. The current study will specifically address community college transfer students participating in an extended summer research experience.

Student Development Models

Among the questions explored in the research on college transitions is the overarching question of how college impacts students, especially in relationship to the retention and persistence of students. To explore this question, some researchers begin with an overview of conceptual models created by Vincent Tinto (1993) and Alexander Astin (1993), which identify several components shown to have a broader impact on student outcomes. I will briefly discuss their models here to help situate the current research study within these broader perspectives. Additionally, I conclude this section with a look at Nancy's Schlossberg's (1981) Transition Theory and Model, due to its occurrence in some of the more recent literature that explores concerns related to student retention and persistence.

Vincent Tinto's Departure model. Vincent Tinto (1993) described the importance of the relationship between learning and retention for students and connected the sum of student experience and engagement with faculty and peers in different settings at the university with the level or "quality" of student effort (p. 71). In his *departure model,* Tinto defines integration as a product of a student's ability to integrate with the academic and social cultures of an institution and that students who do not identify with the dominant culture or community of the university might not persist at the university.

As it relates to students who are routinely identified in transfer group populations, Tinto (1993) noted that nontraditional-aged students, first-generation students, and racial minorities sometimes find it more difficult to fully transition and fully integrate into academic and social communities. Tinto's model of institutional departure (see Figure 1) suggested that a student's background, including family, academic readiness, and interpretation of fit influence their experiences at the university level.

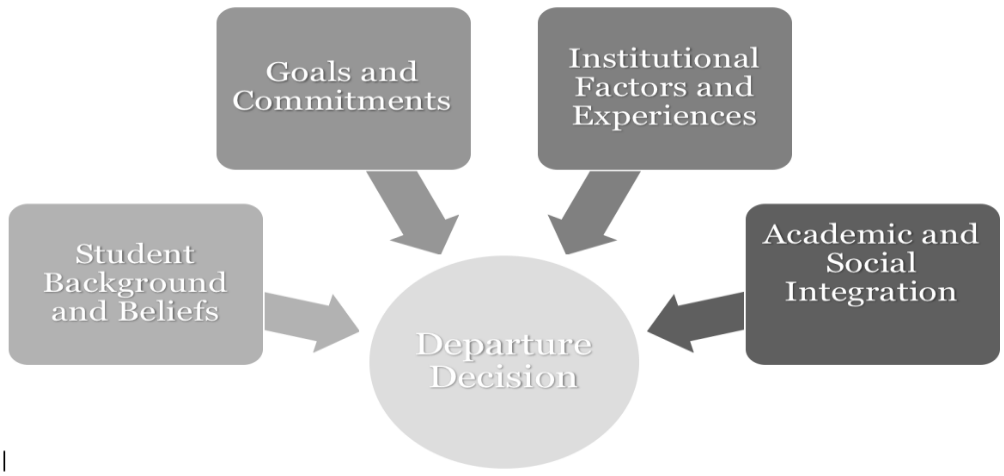


Figure 1. Adapted from Tinto, 1993, p. 114.

Often used as the basis for research related to the first-year experience of all types of university students, Tinto's model of institutional departure has been shown to be less conclusive when used as a framework for the community college student experience as originally conceived, and some researchers have argued that the model is not the best fit for discussions related to community college student development and identity due to its reliance on academic performance as a measure of successful integration (Pascarella & Terenzini, 2005). Bahr et al (2013) noted that the various interpretations of academic and social integration from Tinto and others led to inconsistencies and inaccuracies in some of the research on community college students. He argued for more consistent instruments for measuring these categories post-transfer.

Alexander Astin's Input-Environment-Output model. Alexander Astin's (1977, 1993) input-environment-output (I-E-O) model examined the impact of the institution on student persistence (see Figure 2) and identified three specific variables as *inputs* or pre-college characteristics and views that factor into how students think about and experience college. Astin (1993) identified 146 possible input measures that include categories such as race, ethnicity, gender, age, religious preference, high school grades, parental level of education, income level, reason for attending among many others.

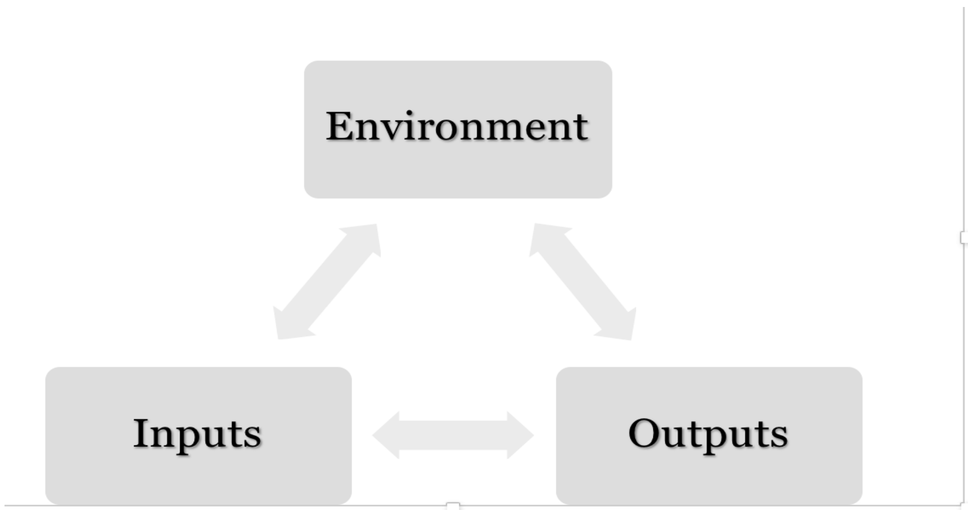


Figure 2. Adapted from Astin's (1993)I-E-O Model.

The variable *environment* includes 192 possible measures of institutional characteristics to include type and size, student peer group, faculty, curriculum, financial aid, freshman choice of major, residential living decisions, and student involvement. This variable is primarily concerned with the interactions and experiences of students while at college (Pascarella & Terenzini, 2005, p. 53).

The final component of the model relates to student *outcomes* and includes 82 measures categorized as personality and self-concept, attitudes, values, and beliefs, behavior patterns, competency and achievement, career development, and satisfaction with the college environment. The goal of this final component is to examine student characteristics after the college experience (Pascarella & Terenzini, 2005, p.53). This component is viewed as directly related to the amount of interaction and engagement during the student's university experience.

Schlossberg's Transition Theory. Nancy Schlossberg's (1981) model was originally used as a foundation for discussions to professional counselors, advisors, and others working with individuals undergoing some type of transition or change that requires the individual to adjust to new expectations, surroundings, and or relationships. Schlossberg's model did not appear as often in my review of the literature related to student development models as the previously discussed models; however, I am including it here due to its fit with earlier models on student development and its emphasis on the individuals' interpretation of their experience while undergoing a transition.

Among the three types of transitions covered by this model are anticipated and unanticipated transitions and non-event transitions. Anticipated transitions are those that require no significant perception of change, perhaps due to the expectancy and or preparation for such transitions. Examples would include normal life activities that may have been previously rehearsed or that perhaps fit a schema, like marriage, or coming of age. Unanticipated transitions fall into the categories of things not considered part of the normal expectations of life. Examples include traumatic events, such as personal injury due to accident or other type of trauma, sudden illness or death, job loss, among others. Non-event transitions are a result of unrealized expected events. An example might be someone who plans to go to college after high school but is forced to delay for some reason. Other examples might include having to continue working while going to school when the expected transition included transitioning to school full time. Each of these transitions alters the individual's life in some way and requires the individual to adapt and adjust to a different role.

The first area of the model is known as *Approaching Transitions.* A person in this area would identify the type of transition and consider the approach needed to navigate the experience. The core of the model, the *4 S System,* relates directly to those resources or variables, internal and external available to the person in transition.   The four S's of the *4 S System* refer to *Situation, Self, Support, and Strategies. Situation* addresses what is happening in the situation. The second portion, *Self* is the recognition of to whom the situation is happening. The third portion of the model is the *Support* component, which includes an assessment of those resources available to the individual. The fourth and final portion of the model explores what *Strategies* or what approaches or methods the individual will use to cope.

Research on Community College Transfer Students

Studies have shown that community college students are one of the sub-groups of transfer students who struggle academically and socially in their first semester after transfer to the university. In a quantitative study, Windham (1995) explored the relationship between students' grade point average, placement test scores, race, sex, age, enrollment status, and information related to workforce placement to examine factors related to student attrition. The researcher concluded that traditional or college-aged students were more likely to persist and nontraditional students were more likely to dropout due to external factors. Additionally, nontraditional transfer students struggle to adjust to university life (Bean & Metzer, 1985). This is partially due to a greater chance of these students having more external obligations (e.g., family, work, and other responsibilities) that compete with the academic and social demands of the university setting. Roach (2008) found that two-thirds of low income, first-generation students continue into sophomore year, compared to 85% of students with a parent who is college-educated.

Several qualitative studies have shown that community college students want more support and interaction at the university (Flaga, 2006; Lee, 2001; Townsend & Wilson, 2009). Townsend and Wilson (2006) interviewed 19 community college transfer students attending a research university to gather information about their experiences as transfer students. The researchers in this study sought to gain a better understanding of student perceptions of the impact of the entire transfer and integration experience, including access to university resources, like student orientation, designed to help transfer students' transitions. Students reported general satisfaction with the resources, but some students felt the formal programs did not give them what they needed to effectively navigate the academic and social cultures of the university. Many described feeling lost and "intimidated," especially in large lecture classes (Townsend & Wilson, 2006, p. 446). Students also struggled with the difference in grading and opportunities to demonstrate learning in the classroom (Townsend & Wilson, 2006).

Tinto (1993) demonstrated the relationship between students' academic and social experiences in college and their persistence.   As an example, first-year students who completed the National Survey of Student Engagement (2013) described the campus environment as lacking support for student success. Older students and military veterans reported similar complaints. Additional studies established a relationship between first-year student perceptions of support at the university level and overall academic and professional success (Belcheir, 2001; Laird, Chen, & Kuh, 2008; Zhao & Kuh, 2004).

Related to the topic of institutional support and transfer student success, a Lloyd and Eckhardt (2010) study suggested more student-faculty interactions and peer-led team learning (PLTL) might increase the number of successful transfer students. Additionally, academic support initiatives to help retain students enrolled in science majors such as tutoring is helpful, but students tended to gain more from tutoring when peer leaders worked as tutors for a course and all components of the class and the tutoring session were in alignment (Lloyd & Eckhardt, 2010). They concluded that students were more responsive to support systems such as tutoring when the services were connected to course work and that while these systems are often available, they were not offered in a way that is convenient for weaker academic students who often also have a job.

The body of research on community college students who transfer to a bachelor's degree granting institution contains a mixture of quantitative and qualitative studies on topics related to pre-transfer and post-transfer concerns, but often missing is program-specific research on instructional strategies to determine how and if such strategies motivate students to persist at the four-year institution in a specific major.

Summer Programs and Student Transitions

Students' integration into the university and its environment is linked to student satisfaction and success. Summer bridge programs are seen as an important transitional component for underrepresented students entering a four-year college (Ackerman, 1991; Garcia, 1991; Gold, Deming, & Stone, 1992; McElroy & Armesto, 1998; Pascarella & Terenzini, 2005; Walpole et al., 2008). Bridge programs are often provided at institutions to help students transition from high school to college. Realizing that the social and academic demands may be challenging for some, these programs allow students to work with other students. The gains from these types of programs are documented both quantitatively and qualitatively in the literature. Hunter, Laursen, and Seymour (2006) conducted an ethnographic study of an apprentice-style summer research experience across four liberal arts colleges and found that students gained cognitive and practical skills. Thiry and Hunter (2009) conducted a quantitative survey study of 33 students who completed a summer bridge program at Louisiana State University. The researcher found strong gains among the participants in the areas of social, professional, and academic skills. In contrast, Townsend and Wilson (2006) concluded that more could be done at the university level to help community college transfer students find their place at the university.

According to multiple studies, important advantages of bridge programs are that the components and strategies in their design allow students to build relationships with faculty and each other while participating in a structured, supportive environment, which is significant for students, especially those students who identify as underrepresented (Shanahan, Ackley-Holbrook, Hall, Stewart, & Walkington, 2015). Seymour, Hunter, Laursen, and DeAntoni (2004) conducted a mixed methods study that examined the academic and professional gains of a research experience on students at two separate research institutions. Seventy-three students who were classified as novice or experienced researchers participated in the study. The researchers concluded that students who were identified as experienced showed cognitive and professional gains.

Qualitative studies by Hunter, Laursen, and Seymour (2006) and Thiry and Laursen (2009) and Thiry and Hunter (2011) explored the impact of student participation in research on their confidence in conducting research as well as cognitive and professional development. The results showed similar patterns of academic growth and socialization among students who participated in some type of summer research experience. Lopatto (2007) conducted a follow-up quantitative study to validate student responses to the 2003 Survey of Undergraduate Research Experiences (SURE) completed by 1,135 undergraduates from 41 institutions of higher learner. Findings from the second study, which was also a quantitative survey, suggested that participation in a summer research experience reinforced or further enhanced students' desire to advance as researchers.

Kremer and Bringle (1990) conducted a quantitative study in which junior psychology majors formed two groups based on an application and selection process that involved GPA, SAT scores, essay, and interview performance. Participants were in either the control group or participant group. Students who participated in the 10-week intensive research project spent 40 hours or more a week working on a science research project. Three years after the study, Kremer and Bringle (1990) contacted the students for a follow up phone survey to determine the impact of the full-time research experience compared with the control group of students who did not participate in an intensive research project. Students who participated in the intensive research project were more likely to have presented their research at a national conference. These students also felt more confident in their abilities to conduct and report on research than those in the control group (Kremer & Bringle, 1990).

In a qualitative study that followed an earlier quantitative study, Stolle-McAllister (2011) examined the experience of approximately 134 Black students who participated in a pre-college summer bridge program over a six-week period. Participants in the program lived on campus and participated in academic and social skills courses. Through a focus group activity after the conclusion of the program, Stolle-McAllister (2011) revealed multiple student perspectives that supported findings of their earlier longitudinal study.   The researchers concluded that the academic, social, and professional components of the program were helpful to student participants. Love et al. (2007) conducted a mixed-methods study of doctoral students to explore the relationship between students' early research experiences and their long-term thoughts about research. Among the findings, the researchers concluded that mentoring and faculty support were important factors related to individual student satisfaction. The researchers suggested that future research might explore research team experiences, including the role of faculty.

Transfer students and STEM. Less than 50% of underrepresented students in STEM areas who enter a science major as an undergraduate persist in that major until graduation. Women and minorities, in particular, are less likely to complete a degree in STEM. Jackson (2013) researched the impact of support systems on student success in women who transferred from a community college into STEM at a university. Jackson (2013) used a qualitative design and conducted one-hour long semi-structured interviews. Jackson invited 782 female community college transfer students enrolled in a STEM discipline at a Research I institution in the Midwest to participate in the study. The final sample size was five students selected from a pool of 99 students who responded to an email invitation. Four of the students were seniors, and one identified as a graduate student at the time of the interviews. Jackson (2013) concluded that strong family relationships and familiarity with academic support, including support from faculty and advisors, helped students remain motivated.

Undergraduate Research as Transition Programming

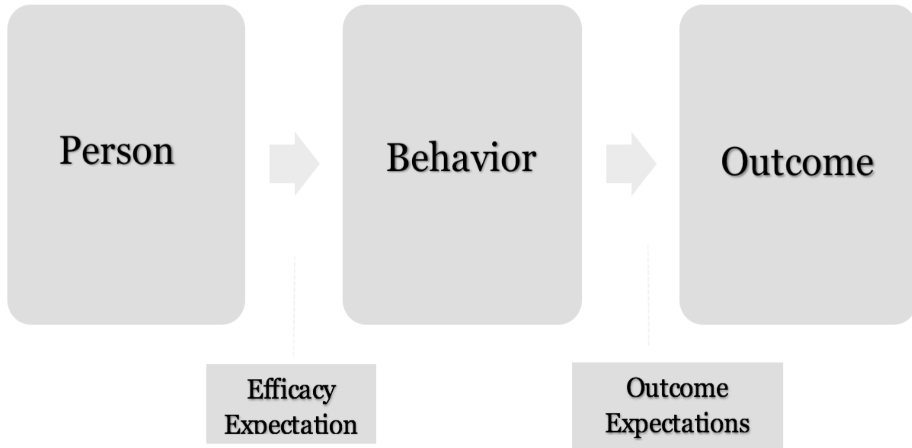
The Council on Undergraduate Research (n.d.) defined research as "[a] n inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline" ("What is Undergraduate Research," para. 1). The scope of this definition allows for many interpretations and may be realized institutionally as large group classroom-based research practices that offer all students a similar type of research experience or a more apprenticed approach which includes more hands-on, structured, and faculty or graduate student-guided research. The history of undergraduate research demonstrates a progression from independent models that focused on giving top performing students opportunities to work with their professor to programs like one at the Massachusetts Institute of Technology (MIT) in which the Undergraduate Research Opportunities Program (UROP) allows any interested student to participate in research (Merkel, 2003). The shift emphasized embracing other students who could benefit from the exposure to research and faculty-student interaction, yet the Boyer Commission on Educating Undergraduates in the Research University (2002) indicated that only one-fifth of all science and engineering students who attend a research university participated in undergraduate research.

Why use undergraduate research as a type of transition program? The Boyer Commission Report (Boyer Commission on Educating Undergraduates in the Research University, 1998) identified undergraduate research as beneficial to students who participated in some type of research experience. Research is a high-impact activity that is positively related to recruitment and retention. In a meta-analysis of multiple studies across university types, Laursen (2010) suggested that student participants from underrepresented groups gain better retention, confidence, persistence, and many other cognitive and psychosocial gains when given the opportunity to participate in undergraduate research. Kuh (2008) noted that participation in high-impact learning, such as research, helps students make more informed career choices and remain satisfied with those choices.

Motivation Theories Related to Student Persistence

This section of the literature review is an overview of the some of the theories of motivation used in research on student persistence in college. The purpose is not to describe any one of these theories in detail, but to identify some of the key constructs used in the study of student persistence and motivation.

Self-efficacy theory and model. Bandura (1977, 1997) defined self-efficacy as an individual's belief that he or she can achieve a desired outcome. As shown in Figure 3, an individual's self-efficacy expectations are connected to their behaviors and outcome expectations. Individuals may increase or decrease their self-efficacy based on performance outcomes. Self-efficacy is *social comparative* and shaped by experience and external assessments (Bong & Skaalvik, 2003). The four primary sources of self-efficacy are mastery experiences, vicarious experiences, social persuasion, and emotional arousal. Mastery experiences are those activities in which individuals are successful in accomplishing the desired outcome. Vicarious experiences are those activities modeled or performed by someone similar to the observer. Verbal or social persuasion relates to receiving verbal support or persuasive feedback. Emotional arousal or state relates to how the individuals perceive their likelihood of being successful at a task (Bandura, 1997).



Adapted from Self-Efficacy: Toward a unifying theory of behavioral change.

Figure 3 Adapted from Bandura (1977).

Research self-efficacy. Self-efficacy theory has also been utilized to explore specific education and career performance outcomes related to an individual's beliefs. Adedokun et.al (2013) applied Bandura's self-efficacy theory to performance outcomes and aspirational careers in research (see Figure 4). Additional research studies have demonstrated a positive correlation between self-efficacy beliefs and academic achievement (Multon, Brown, & Lent, 1991). The impact of research skills and student research self-efficacy can be a determining factor in students' desires to continue in a research career.

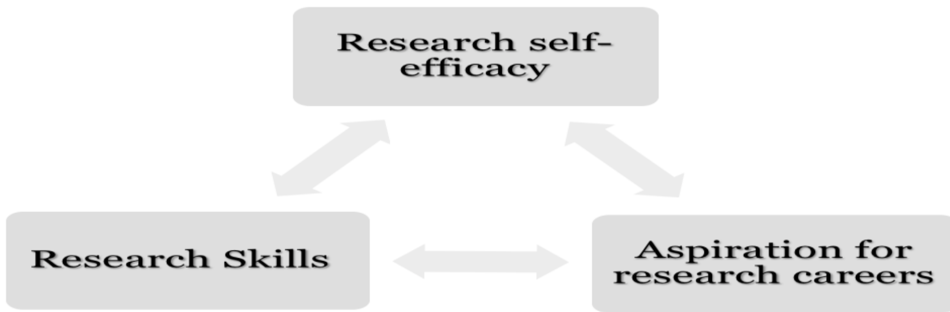


Figure 4. Adapted from Adedokun, Bessenbacher, Parker, Kirkham, and Burgess (2013).

Several studies of both undergraduate and graduate students examined the self-efficacy of student researchers. Luzzo, Hasper, Albert, Bibby, and Martinelli (1999) explored mathematics/science self-efficacy and career interests of career-undecided students. Study participants included women and men enrolled in first-year of college classes who were undecided about their careers. The researchers adapted multiple previously utilized self-efficacy scales to explore math/science self-efficacy and career aspirations and interests (Betz & Hackett, 1983; Cooper & Robinson, 1991; Lent et al., 1991). A total of 149 students volunteered for the research study. The findings showed a positive relationship across math/science self-efficacy and interest in majors and careers that were science and math related. Love, Bahner, Jones, and Nilsson (2007) explored the impact of early research experiences on research self-efficacy. This mixed-method study included 131 doctoral students in a counseling psychology program from multiple states. The researchers found little difference in self-efficacy between those with early research experience and those considered inexperienced researchers. They did conclude that faculty support and mentoring were important to individual perceptions of satisfaction with a research experience.

Efficacy, identity, and career commitment. Chemers, Zurbriggen, Syed, Goza, and Bearman (2011) studied science experiences, efficacy, and identity as variables that might predict underrepresented minority students' commitment to careers in science (see Figure 5). The quantitative survey study included a sample of 327 undergraduates and 338 graduate and postdoctoral fellows. Results showed that self-efficacy without the added components of leadership and teamwork along with identity impacted underrepresented minority students' science experiences and commitment to a greater extent. Similar results were found for the graduate and postdoctoral sample with the caveat that the psychological processes component leadership and teamwork self-efficacy were also a relevant factor in predicting outcomes or commitment.

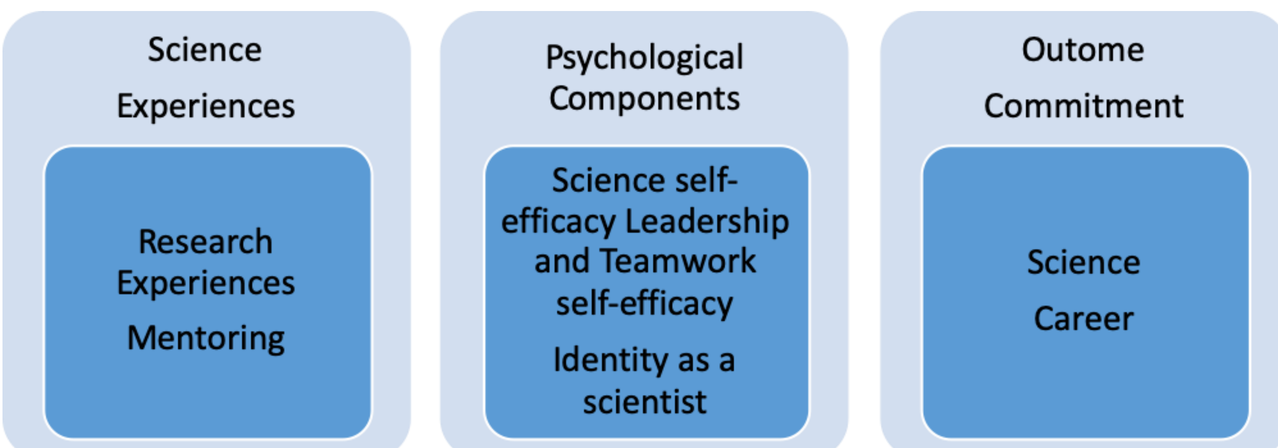


Figure 5: Adapted from Chemers et al. (2011).

Self-efficacy and career choice. Self-efficacy is a central component of social cognitive career theory (Lent, Lopez, & Bieschke, 1991). Betz and Hackett (1983) explored the relationship between mathematics self-efficacy and choice of science-based majors based on gender differences. In a study involving 153 female and 109 male undergraduates who completed questionnaires based on a combination of the mathematics self-efficacy scale, the Bem Sex Role Inventory, and questions adapted from the Fennema-Sherman Mathematics Attitudes Scales, they found that the women in the study had lower math self-efficacy. The researchers posited that women with lower math self-efficacy would avoid subjects and career fields like science that require higher levels of math.

Wright, Jenkins-Guarnieri, and Murdock (2013) examined the relationship between student self-efficacy, persistence beyond first semester, and academic success in the first year of college using social cognitive career theory as a framework and controlling for high school GPA, gender, and first-generation status. Students enrolled in a first-year seminar completed the college self-efficacy inventory scale created by Solberg, O'Brien, Villareal, Kennel, and Davis (1993) at the end of the first semester. The researchers in the Wright et al. (2013) study examined college student persistence in relationship to their college self-efficacy and found a significant relationship between perceived college self-efficacy, persistence decisions, and academic success.

The connection between science self-efficacy and academic and career intentions were examined in Linnenbrink-Garcia et al. (2018). This longitudinal study explored the impact of a summer enrichment program specifically designed to motivate students to remain in a STEM major and to pursue science-related careers. Students attended the summer program during the summer between their first and second year of college. The researchers measured multiple motivational and career-related beliefs in science, including science-research career intentions and science self-efficacy at eight months and 20 months after program completion. The researchers found this type of program was related to persistence outcomes in science-research career intentions and science course completion, and students reported high self-efficacy.

Domain Identification. Elements of motivation may be evidenced when exploring what happens to the individual who identifies with a specific academic domain. With its origin traced back to William James (1890/1950), domain identification can be found in literature related to academic outcomes. Identification with a specific domain is not a new concept, but instead, an essential concept when exploring the relationship between students' performance and motivation. Osborne and Jones (2011) define domain identification as "the extent to which an individual defines the self through a role or performance in a particular domain" (p. 132). This can be further explained as how much students define their sense of identity or self with a particular field or area of study and what impact those implications have on how these students adapt to a particular environment.

Jones, Tendhar, and Paretti (2016) studied the impact of students' perceptions of a required introductory engineering course on their identification with engineering as a major, their motivational beliefs, and major and career goals. Using a sample of 443 first-year engineering students, the researchers used the MUSIC(R) Model of Motivation (Jones, 2009, 2018) to test a hypothesis that the students' perceptions of the five MUSIC components (i.e., empowerment usefulness, success, interest, and caring) could predict students' identification with engineering and, in turn, their major and career goals. The participants completed an online questionnaire based on the MUSIC model, and the researchers concluded that four of its five components were identified and related to students' engineering identification, which predicted their major and career goals.

Ruff (2013) explored the relationship between domain identification and interest in first-year students in a qualitative study of eight first year college students. She conducted two interviews, one in the fall semester and the second in spring semester. The findings indicated that students' "perceptions were consistent with the background factors that encourage students' development of domain identification" (p. 127). The MUSIC model components of Success, Interest, and Usefulness were found in relationship to students' perceptions of their academic major. It was also noted the Caring component could be traced in the students' narratives describing their experiences across the academic year.

MUSIC® Model of Motivation. The MUSIC® Model of Motivation (Jones, 2009, 2018; abbreviated as the MUSIC model) identifies five groups of strategies that can be used to motivate students: (1) *empowerment*, when students believe they have control over their academic experiences; (2) *usefulness*, when students understand how the content they are learning is related to their goals; (3) *success*, when students believe they can perform well with appropriate effort; (4) *interest*, when students find learning enjoyable and interesting; and (5) *caring*, when students feel cared about academically and personally. Researchers have used the MUSIC model to study student motivation in relationship to instructional strategies at different levels of education, including the university level.

For example, Jones, Epler, Mokri, Bryant, and Paretti (2013) studied 47 senior engineering students in capstone courses that utilized a problem-based learning approach in order to explore the relationship between instructional approach and student motivation to engage in the course. The researchers used a two-phase, sequential mixed methods design and began the first phase, a questionnaire, distributed to 47 students, divided across two sections of the capstone course. Fourteen of the students who returned the survey volunteered to participate in the research study and moved on to phase 2 which was the Qualitative portion of the research. Students were asked to answer a series of questions related to the MUSIC model components. The results showed a relationship between the course and students' motivation related to their academic and career goals.

The MUSIC model has also been used to explore student perceptions of first-year courses and transition programs (Lee, Brozina, Amelink, & Jones, 2017; Lee, Kajfez, & Matusovich, 2013; Jones, Epler, Mokri, Bryant, & Paretti, 2013). A case study by Lee, Selmetz, and Amelink (2014) also utilized the MUSIC model to explore the impact of a summer bridge program on the academic motivation of six entering college freshmen in engineering. The researchers concluded that the summer bridge program made students more aware of the demands of an engineering major. It also gave the researchers insight into the transition experience of the six students.

In a follow up to the 2014 case study, Lee, Brozina, Amelink, and Jones (2017) studied the impact of an engineering education summer bridge program on first-year underrepresented students' academic motivation. The quantitative study explored students' perceptions of their summer experience and motivation as impacted by the components of a summer transition program for students entering the engineering program at a major university in the southeastern United States. A sample of 183 students from two cohorts of s summer bridge program completed a questionnaire adapted from the MUSIC model in order to explore more directly the engineering bridge program and its components. The findings showed differences in perception and impact among the subgroups in the motivation constructs examined, and the researchers determined that the model worked for assessment of a summer bridge program.

Summary of the Literature Review and Current Study

In this chapter, I reviewed Tinto's (1993) model on students' departure and Astin's (1977, 1993) input-environment-output model. Both of these models are seen in literature related to student development at the university. The difficulty in using these models when researching community college transfer students' experiences and perceptions is one that can be traced back to the original intent of these models, which is to measure outcomes of traditional students. Given the diverse backgrounds of community college students, a scale that adapts to individual experiences, while maintaining consistency and validity, is needed. Schlossberg's model is more conducive to capturing the varied perceptions of the transition experience as it relates to the subpopulations of community college transfer students; however, it does not allow for an in-depth analysis of the instructional components of a specific program as they relate to student motivation, which is the focus of the current study.

In this chapter, I also explored the research on transitional programming that included undergraduate research and bridge programming, which were shown to have a positive impact on traditional students' persistence and success (Hunter et al, 2006; Kuh, 2008; Laursen, 2010; Pascarella & Terenzini, 2005). However, missing from the literature is research that examines the impact of an institution-specific bridge program on community college students' academic and career motivation at the university. Bahr et al (2013) suggested that more program specific studies of transfer students' experiences post-transfer are needed.

Alper (1993) and Hernandez, Schultz, Estrada, Woodcock, and Chance (2013) described the need for administrative personnel to retain underrepresented students in STEM majors by identifying strategies to maintain their interest and motivation beyond the first semester. These studies exist and are included in the literature explored in this chapter; however, a gap exists in similar studies that look at specific programing strategies designed to motivate community college students who later transfer to the university.

The current study seeks to build on the work of Lee, Brozina, Amelink and Jones (2017) who explored the impact of an engineering education summer bridge program on first-year underrepresented students' academic motivation. I will use the MUSIC model (2009, 2018) as my conceptual framework.

Chapter 3: Methodology

Purpose

In this mixed methods study, I explored the experiences of community college transfer students who participated in a summer research program at a major university. The two specific research questions that drove the study are as follows:

1. What is the influence of a summer program on community college transfer students' science-related self-efficacy, science identification, and science-related goals?
2. How do community college transfer students' perceptions of a summer program affect their effort in the program?

I chose a convergent parallel mixed methods design as discussed in Creswell & Clark (2011) and collected survey and interview data collectively and then mixed the findings during the analysis of the information received.

Philosophical Assumptions and Research Design

Creswell and Clark (2011) identified four worldviews related to research: postpositivist, constructivist, participatory, and pragmatic. A postpositivist worldview, which is often at the core of quantitative research, is grounded in "empirical observation and measurement" and "theory verification" (p. 40). A constructivist worldview sometimes more prevalent in qualitative research allows for multiple participant meanings as well as the social and historical construction of meaning. The participatory worldview is suitable for research designed to be collaborative and change oriented; so while the participatory worldview might also be qualitative in nature, its focus tends to be "empowerment and issue oriented" (p. 40). Pragmatism, which is the philosophical assumption that I chose for this study, focuses on the questions asked and the exploration of the questions through multiple methods of data collection. I utilized quantitative and qualitative approaches in this study to better explore the phenomenon.

For the quantitative piece, I explored the first question through a pre-and post-program survey. I administered the initial survey in May before start of the program, and I administered the follow-up survey the last week of the program. For the qualitative piece, I conducted interviews with the participants in the last week of the program.

Participant Information

Participants were current, or recently transferred community college students who self-identified as underrepresented or underserved (as defined by the sponsoring program) and were interested in earning a bachelor's degree in a targeted area of science at the host university. The program included up to 10 students recruited from each of three partnering community colleges known to have students who fit the underrepresented or underserved category based on race, gender, economic factors, or identification as a first-generation student. There were eight students enrolled during the summer when the study was conducted, and seven students participated in the entire study (see Table 1 for the characteristics of the seven participating students). Five of the seven participants were females and the participants ranged in age from 18 to 23.

Table 1

Characteristics of the Seven Participating Students

Ethnicity	Intended Major	Underrepresented /Underserved Group	Career Goal
Caucasian	Biochemistry	First Generation	Pharmaceutical
Caucasian	Psychology and Sociology	First Generation	Criminal Psychologist
African-American	Neuroscience	First Generation	Neurosurgeon

Hispanic/Latino	Biology/Biomedical Engineering	First Generation	Medical Engineer
Caucasian	Microbiology	First Generation	Clinical Microbiologist
Asian	Biochemistry	First Generation	Cardiothoracic Surgeon
European and Pacific Islander	Biotechnology	First Generation	Research and Development

All participants in the program were required to work up to 27 hours per week on their research assignment under the guidance of a faculty or graduate student mentor in science. Additional hours (for a total of 40 hours each week) were spent in academic and professional development activities related to academic enrichment (see Table 2 for list of activities).

Table 2
Summer Program Components

Orientation	• Students completed survey before orientation • Students completed safety training • Students completed lab-specific training • Students discussed of their research assignment and expectations
Graduate Record Examination (GRE) Training	• Students took GRE pre-test in late May before training began • Students met weekly for 3hrs for test prep • Students took GRE post-test in July to determine level of improvement
Research	• Students met with faculty mentor in the first few days of internship to determine type and scope of summer research project • Students worked with mentor and lab assistants on research project design and process • Students spent up to 28hrs weekly on research project
Professional Development	• Students met weekly to learn about professional development topics • Students completed Strengths Finder • Students received instructions on how to write an abstract • Students received instructions on how to create a poster for a scientific poster session

	• Students created poster and submitted to faculty mentor and program director for feedback • Students created short oral presentation and practiced in front of the program director and coordinator • Students completed program post survey

Each of the participants' applications were shared with interested faculty who then agreed to mentor the participant for 10 weeks on a specific research project related to the mentor's area of research. At the end of the program, the participants were required to prepare a poster to be displayed and discussed at an on-campus symposium. Additionally, participants were required to deliver a 10-minute PowerPoint presentation that included their problem statement, research design, and results. The closing presentations were two separate events scheduled over a two-day period. Audience members which included faculty, other summer research students, family and community members, were allowed and encouraged to ask questions.

Research Design

The purpose of this study was to explore the relationship between a summer research program and students' short and long-term career and academic goals related to science before and after completing the program. I used a mixed methods approach to examine the phenomenon more fully through qualitative interviews and quantitative surveys. As Feilzer (2010) posed the question: "If phenomena have different layers how can these layers be measured or observed? Mixed methods research offers to plug this gap by using quantitative methods to measure some aspects of the phenomenon in question and qualitative methods for others" (p. 9).

The goal of this study is to explore how participants' MUSIC (i.e., empowerment, usefulness, success, interest, and caring) perceptions of their experience in the summer research program might lead to increased science identification and science self-efficacy, which might then lead to greater and sustained effort in the program, which can affect their science-related academic career goals (see Figure 6). The relationships between these variables have been theorized (Osborne & Jones, 2011; Jones, Ruff, & Osborne, 2015) and tested (Jones, Osborne, Paretti, & Matusovich, 2014; Jones, Tendhar, & Paretti, 2016) elsewhere; the aim of the present study was to test these relationships within the context of a summer bridge program for transfer students

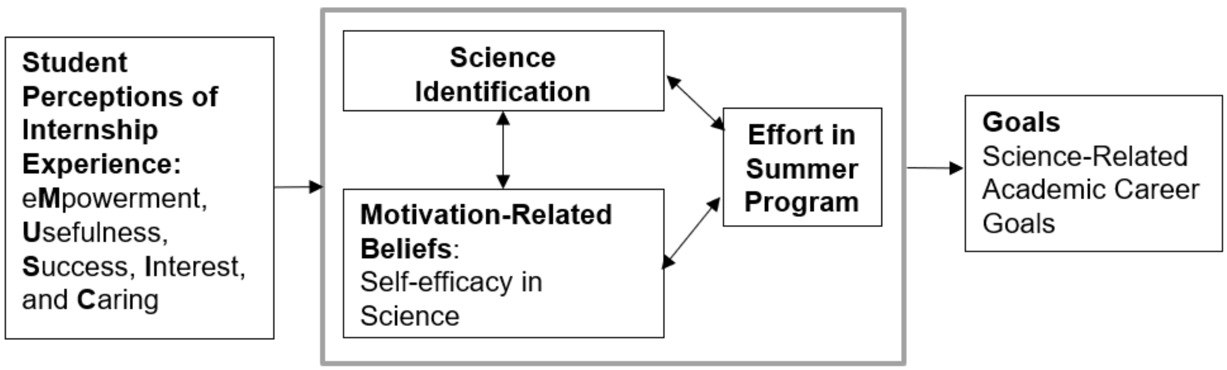


Figure 6: Constructs examined in the study

I utilized a mixed methods approach to explore multiple participant perceptions and interpretations of a lived experience through concurrent triangulation. By relying on quantitative and qualitative methods, I was able to substantiate data collected in each approach, thereby negating any potential weakness of one method over the other with each approach given equal value and mixing only during the analysis stage of the process. I relied heavily on the characteristics of mixed methods research as identified in Creswell and Clark (2011, p. 5):

- Collects and analyzes persuasively and rigorously both qualitative and quantitative data (based on research question);
- Mixes (or integrates or links) the two forms of data concurrently by combing them (or merging them), sequentially by having one build on the other, or embedding one within the other;

- Gives priority to one or to both forms of data (in terms of what the research emphasizes);
- Uses these procedures in a single study or in multiple phases of a program of study;
- Frames these procedures within philosophical worldviews and theoretical lenses; and
- Combines the procedures into specific research designs that direct the plan for conducting the study.

Data Collection

The summer program had an existing Institutional Review Board (IRB) protocol accepted and in place. I received confirmation from my institution's IRB that the current IRB would cover my planned data collection, including use of the program application materials, survey responses, and interviews.

For the quantitative portion, the eight program participants received a link to the survey and were asked to complete it within their first two days on campus in May. The survey captured their initial thoughts related to science self-efficacy, identification, and science-related goals before they began working with their research mentor. The survey included 16 questions that probed students' thoughts about careers and their academic abilities related to science (see the Appendix for the survey questions). Participants completed the same survey questions again during the last week of the summer program in July.

The next step of data collection included a qualitative in-person semi-structured interview with each participant after they submitted their final projects at the end of July. The six open-ended interview questions were adapted from the MUSIC® Model of Motivation Inventory (Jones, 2017) and included a final question, distributed as a follow-up, after they completed their final presentations. Seidman (2013) identified "[t] he purpose of an in-depth interview study is to understand the experience of those who are interviewed, not to predict or to control that experience" (p. 54). The total time to complete both interviews was approximately 30-45 minutes.

The participants received detailed information about my roles, past and present, with the program and also received information about my role as the researcher for the current study in order to address what Creswell (2013) refers to as a power imbalance. I also informed them about the data collection process and analysis.

Measures

Science self-efficacy. The science self-efficacy items measured participants' self-efficacy for different science-related activities (e.g., writing a hypothesis statement). These items were created by the program personnel to evaluate the program. Survey response options were structured using a 0-5 Likert scale, and students rated their perceived level of confidence using the following scale: 0 = *not at all confident*; 1 = *not very confident*; 2 = *somewhat confident*; 3 = *confident*; 4 = *very confident*; and 5 = *extremely confident*. Each participant completed an online pre- and post-survey, and I averaged scores for the individual items in each survey to generate a mean score for the items in each survey.

Science identification. The science identification items measured students' level of interest in a variety of with occupations that require advanced science training and research skills (e.g., becoming a science researcher). These items were created by the program personnel to evaluate the program. Items were structured using a 0-5 Likert scale, and students rated their level of interest on the following scale: 0 = *not all interested*; 1 = *not very interested*; 2 = somewhat interested; 3 = *interested*; 4 = *very interested*; and 5 = *extremely interested*. I averaged their responses to create a mean score for each of the questions.

Career goals. I received IRB permission and obtained participants' self-reported career goal information from the program application questionnaire. These items were created by the program personnel to explore participants' career goals pre and post-program. Their goals were then compared with their self-reported goals as articulated in response to the six interview questions that were adapted from the MUSIC® Model of Motivation Inventory (Jones, 2017). The items used in this study were selected to allow greater emphasis on participants' perceptions of how the program affected their science-related academic and career goals (e.g., I am considering applying to graduate).

Setting and Sample

The research setting was a large university in the Southeastern United States. A total of eight students completed the program and while all eight voluntarily participated in the qualitative portion of the study, I collected pre- and post-surveys electronically and was unaware until later in the process that not everyone completed the follow up survey. To keep the mixing of the results consistent, I excluded data from the student who did not complete all portions of the study. The number of participants remained consistent with Polkinghone's (1989) suggestion that an appropriate number of participants in a phenomenological study should be in the range of 5 to 25.

Audit Trail

I maintained an audit trail that included my observations throughout the program and additional details not immediately addressed by the interview questions. I reviewed these notes along with the digital audio recordings and transcripts of the interviews periodically before and during data analysis.

Reflexivity

I was employed as the Coordinator for the program at the time the study took place. I assisted with student activities three years prior to the study and then led the organization of professional development programming in my second year; however, I had no direct supervision of the students who participated in the summer research experience. Each student was assigned to a faculty or graduate student mentor and reported directly to that person as their project supervisor during the summer program.

Data Analysis

Quantitative analysis. I compared the mean scores from the pre-and post-surveys; however, I did not conduct a statistical test to compare the means because the number of participants (n = 7) was too small to obtain meaningful results. To begin my analysis of the descriptive surveys, I first compared the participants' pre-survey responses collected in May to the information received from each applicant when they initially applied to the program in February. I did this to determine whether any of the students changed their choice of major before they began the program in May. I did not find any changes between their responses at application and in the pre-survey.

Qualitative analysis. Next, I reviewed their responses to the pre-survey collected in May before the start of the program and compared their survey responses with those collected during the final week of the program in July. I then calculated a mean pre-score (score from May) and post-score (score from July) based on their responses to the following questions:

1. Please rate your level of confidence in the following.
2. To what extent do you agree or disagree with the following statements about attending graduate school?

3. Thinking long term, please rate your level of interest in the following.

This series of questions were directly related to RQ1 and the mean scores showed any potential influence their experience in the program may have had in these areas. Because the program contains many layers of academic support and enrichment, my next goal was to see if the instructional components changed their perceptions in any way.

For the qualitative analysis of the digitally recorded interviews, I listened to all recordings and noted any observations or concerns related to quality of the recordings or the questions before sending the recordings to a professional transcription service to be transcribed. I used a professional transcription service in order to decrease the time between the interviews and my initial review and analysis. Additionally, this step increased the descriptive validity of the data. Before reviewing the transcripts, I reviewed my field notes related to their interview. Next, I reviewed the professionally prepared transcripts and compared each one to the recorded interview. I marked any mistakes found in the transcription.

In the next stage of my analysis, I manually coded the transcripts and categorized items based on similarities. Creswell (2013) described this process as pulling apart the data and sorting by topics and categories. I then reviewed the transcripts and broader themes two additional times, coding specifically for those themes related to empowerment, usefulness, success, interest, and caring from the MUSIC model. I identified instances in which all five MUSIC components were present in the qualitative data. My next step was to isolate those sections for further analysis and comparisons.

Chapter 4: Results

I conducted this concurrent triangulation mixed methods study to determine the relationship between a summer research experience and participants' beliefs in science and examined their short- and long-term academic and career goals upon entering the program and again during the last week of programming. In this section, I examine the results of the study by presenting the results related to Research Question 1 first, followed by the results related to Research Question 2. The results include descriptive statistics for the quantitative portions and thematic analysis for the qualitative phase.

Research Question 1: Program Influence on Science-Related Self-Efficacy, Science Identification, and Science-Related Goals

The first research question was: What is the influence of a summer program on community college transfer students' science-related self-efficacy, science identification, and science-related goals? This question examined participants' beliefs about their desire and ability to continue along pathways related to their academic and career goals in science.

Students reported higher values in science self-efficacy in areas related to studying science, including completing a literature review and problem-solving skills post-program but lower values were reported post-survey in having a successful career in science.

Table 3

Self-Efficacy Levels Pre-Survey and Post-Survey

Please rate your level of confidence in the following.	Pre-survey M (SD)	Post-survey M (SD)	M difference
Being a successful student in science	4.86 (0.83)	5.00 (0.76)	-0.14
Having a successful career in science	4.86 (0.83)	4.57 (0.49)	0.29

Completing a literature review	4.14 (1.12)	4.43 (0.73)	-0.29
Explaining technical ideas to various types of audiences	3.86 (1.46)	4.29 (0.88)	-0.43
Working with others as part of a team	4.71 (1.03)	4.71 (0.88)	0.00
Problem Solving	4.43 (0.73)	4.86 (0.41)	-0.43
Writing a hypothesis statement	4.14 (0.99)	4.14 (0.98)	0.00
Creating a plan for a research project	3.57 (1.18)	3.71 (1.35)	-0.14

Note. This table includes the seven participants who completed both the pre- and post-surveys. M difference refers to the mean difference between the M pre-survey and M post-survey.

The majority of the students remained interested in careers that required training beyond a bachelor's degree with higher values reported in the category "becoming a health care professional or nurse" in the post-survey and lower values reported in the areas related to being a science researcher or a medical doctor which dropped 0.54 from 4.83 pre- to 4.29 post. Their interest in teaching at a university remained consistent across both surveys at 3.00.

Table 4
Student Perceptions of Interest Pre-Survey and Post-Survey

Thinking long term, please rate your level of interest in the following.	Pre-survey M (SD)	Post-survey M (SD)	M difference
Teaching at a high school	2.43 (1.29)	1.86 (1.12)	0.57
Teaching science at a community college	2.86 (1.46)	2.14 (1.36)	0.72
Teaching at a university	3.00 (1.69)	3.00 (1.60)	0.00
Conducting biomedical research at a university	4.71 (1.48)	4.29 (1.83)	0.42
Becoming a science researcher	5.14 (0.83)	4.00 (1.51)	1.14
Becoming a health care professional or nurse	4.57 (1.05)	5.00 (1.07)	-0.43
Becoming a medical doctor	4.83 (1.46)	4.29 (1.39)	0.54

Note. This table includes the seven participants who completed both the pre and post-surveys.

M difference refers to the mean difference between the M pre-survey and M post-survey.

While the difference in level of agreement related to applying and being prepared for graduate school decreased during the program, the students reported higher numbers in response to the questions directly related to having an awareness of the expectations and demands of attending graduate school. The students also reported higher numbers in the areas related to jobs in health care such as becoming a nurse. The pre-survey mean was 4.57 in comparison with an increase to 5.00 post-survey related to their agreement with an interest in becoming a health care professional or nurse.

Table 5

Participant Level of Agreement About Graduate School Pre-Survey and Post-Survey

To what extent do you agree or disagree with the following statements about attending graduate school	Pre-survey M (SD)	*Post-survey* M (SD)	*M* Difference
I am considering applying to graduate school	5.29 (0.88)	4.71 (0.88)	0.58
I feel prepared to apply for graduate school	4.14 (1.25)	3.71 (1.39)	0.43
I feel that I am a strong candidate for graduate school	5.14 (0.83)	4.57 (1.29)	0.57
I understand what the graduate school experience will be like for someone in my field	3.71 (1.67)	3.86 (1.25)	-0.15
I know what skills I need to develop in order to be successful in graduate school	3.86 (1.64)	4.29 (1.03)	-0.43

Note. This table includes the seven participants who completed both the pre and post-surveys
M difference refers to the mean difference between the M pre-survey and M post-survey.

Research Question 2: Students' Perceptions of Program Components and the Effect on their Effort in the Program

Research question 2 asked: How did students' perceptions of the program affect their effort in the program. Students were asked this question during the interview to capture participants' reflection across the entire span of time during the program. I used interview questions to assess each component of the MUSIC model in order to more readily explore possible connections between the students' perceptions of specific program components and the motivational constructs of science identification, science self-efficacy, effort, and goals. I coded their interviews several times, moving from broader categories to the more specific five components of the MUSIC model. This step allowed me to situate their interview responses more directly within the motivational framework of the MUSIC model. I describe my findings related to the MUSIC model components in the next few sections.

Empowerment

As part of their research project, all of the participants were assigned to a new or ongoing research study related to their general interest. I asked them to reflect on their specific research assignment in responding to this question: What aspects of the program affected how much control you had during the program? The responses varied in some instances based on what their expectations of the project were and some students had more control over their research project, including its design, while others felt they mainly had more control over their work hours.

Two of the participants who had more advanced research skills (based on the information they shared with me) described how their ability to quickly understand the nature and expectations of their project allowed them to have a stronger voice in what portion of the research they took on independent of the other researchers in the lab or on a team. As Cameron stated:

> I think in my lab I had the most comfort in having control when it came to my work. I produced good results to my mentor and grad student. Before I knew it, the only help that they would help me in with my experiments would just be setting it up. After that, they were, I believe confident in me to produce the results they wanted and they are using most the results that I have…that I was able to find in doing my experiments.

Ralph stated:

> I feel like at least my peer mentor offered enough areas to where if you want to modify this project in any way, let me know and we can try and work something out. That's why I felt like there was some control in the independent project that we get to conduct. It's like we have, for my situation, was a general outline that you can follow. But if you want to deviate in some ways, you can.

He continued talking about how he was able to "outline what I wanted to do, maybe like an experimental design, then brought it to my mentor to make sure I was doing the right thing, to make sure…my thought process was correct her and [to ask] do we have time to accomplish this?"

Other participants reflected on feeling more in control of their work schedules. Adrienne felt less control over the experimental design and accepted that as an appropriate learning experience. She responded to the question about control in the following way:

> My hours were pretty flexible….I didn't necessarily have control over things because they wanted me to research various specific aspects…But, it wasn't necessarily a bad thing, because it was qualities I had to learn….When I did get the hang of certain things, they would kind of just let me go at it. They weren't looking over my shoulder. They would just let me code and let me edit and stuff

> like that and just check it after I'm done. They wouldn't check on me every five minutes to make sure everything's okay and stuff like that.

Emily described her lab situation as one in which discussions about the project were ongoing, and she was included in these; however, her sense of control reflected mainly around her schedule:

> I would sit down with my mentor and discuss options, because the way that our procedures were set up, necropsies we have to wait six to seven days before we can continue and proceed with the sample, so it was a lot of scheduling that I was most definitely a part of.

Usefulness

Related to the usefulness component of the MUSIC model, I asked participants to reflect on their summer experience in relationship to their academic and career goals. All of the participants articulated how their experiences allowed them to focus on a specific career goal and all remained committed to science-related goals. For some, the primary outcome in this area was one of greater awareness of how the academic and professional pieces fit together. As Cameron, who plans to major in biomedical engineering explained:

> Before I came to the program I was still deciding whether I wanted to pursue a strictly Biology or Engineering career, but now I see how well they both fit together. I want to continue advancing both of those aspects.

Mary shared the following:

> When I came in I was [deciding] between neuroscience and biology, so being in the neuroscience lab, I was like 'Yes, this is what I want to do."

Another student stated that while help was there if needed, the experience taught him how to be professional and to manage his time effectively.

Keegan described how the program helped her think more about options available to her:

> So [this program is] definitely a boost up in my resume…I definitely gained a lot of research experience. I knew many of my peers wouldn't back home, and it made me realize that I liked research a lot more than I [thought] I would because I didn't think I would enjoy research and sitting in a lab all day. But, I actually do.

Adrienne who plans to pursue forensic or clinical psychology and is interested in working with juvenile delinquents described being offered explanations of the differences between two areas of psychology by other researchers on her team, including her mentor. She explained how her goal was refined from being "very set on going into a specific prison and helping people one on one" to realize her goal might require a different major or double major, such as psychology and law. In her words, "It kind of raised more questions than I had before, but in a good way." Ralph explained it by projecting what he was learning to his professional goals as a researcher:

> So this really helps improve how do you create an experiment on your own and how you design that and make sure you can follow through with it. And I think it's definitely good for professional training… [cause] at least in my lab environment, you were very much so on your own. It was up to you to do your work and to analyze your data and to conduct experiments.

Emily characterized her experience in the program and specifically her orientation to the project in the following way:

> ... [It] threw you into the water a bit, which was good. I think you kinda need that shock. This is a new environment and it's not something you can really ease yourself into. I

> came into the lab…not knowing how to use a pipette. It was a big change from pipetting to working on a million necropsies and doing western blot tests and testing for a whole bunch of things that I hadn't heard about before I entered the lab.

Success

To assess students' perceptions related to the success component of the MUSIC model, I asked participants what aspects of the program affected their beliefs about whether they could succeed or not as they progressed through the experience. All of the participants felt comfortable with the experience and all described areas related to scientific research and academic enrichment where they had gained new skills and increased science-related self-efficacy by program end. Cameron described his beliefs in his ability to succeed in the following way:

> [It] helped me strengthen my ability to be successful. There will always be minor mistakes and problems when it comes to research, but I think that as long as you have a clear goal in mind, and you always try to strive for it, it's only a matter of time before it becomes a reality.

He also explained how comfortable he grew with his work in the lab after producing "good results" and knowing that his mentor and grad student were confident in his abilities to complete the experiments.

Adrienne described her personal growth and beliefs in her ability to succeed from start to finish:

> I like being good at things immediately. I don't like having a learning curve, and with research you kind of almost always have that learning curve. So, I would make small mistakes and it would frustrate me, but you have to remember at the same time, you're not gonna get it all right off the bat. So, that was kind of concerning at first, but taking a

step back kind of made me more comfortable with it… I thought I would do okay, but leaving the program I think I'm at probably a seven now at least on a scale of 1 to 10."

Similar responses related to confidence and the belief that they could succeed at the university were documented across all of the interviews. Ralph described his belief in his ability to succeed in the context of looking at what his peers were doing:

> It made me feel more comfortable conducting research or conducting lab techniques on my own without somebody staring over my shoulder. And then, no top of that, talking to people like, "What? You have to do a presentation and a symposium and all that?" And they're still undergrads but they haven't even done that, so I think that makes me feel like, I guess, kind of good about that. I feel like I'm getting my…I'm getting used to it, being exposed to the conferences. So it's like practice almost. But it's like very intensive practice…so it makes it feel like I can be successful when it comes to crunch time, how can you navigate this and complete everything and then be able to present good polished product at the end of it all…This isn't too bad.

Brianna responded to this question by describing how she was able to demonstrate to herself and others that she could do the work:

> My main interest was getting the undergraduate research experience and it's just an awesome opportunity for people from community colleges that kind of, there's a stigma I guess against community college students…so it was interesting to be able to show that we're not any different. That we can learn just as well.

Interest

I also asked participants about which aspects of the program affected their interest and enjoyment. All of the participants expressed remaining interested throughout the program and found most of the program components enjoyable.

Mary described how she initially had planned to major in neuroscience but also had an interest in biology before she began her research project related to brain development in the neuroscience lab. She summed up how her time and experience working on the research project led her to conclude that "Yes, this [neuroscience research] is what I want to do."

Keegan found the ability to gain research experience helped her realize that she enjoyed "research and sitting in a lab all day." She described how the experience helped her to rethink and improve her work ethic as well.

On a similar note, Erin spoke about how the program" reinforced that I wanted to go to ____ for my undergrad and bachelor's degree, and it's made me think about how being a mentor, how it can affect someone and…help them progress. I would like to do something similar.

Cameron stated the "ability to work hands on with my experiments. What I like most about Engineering is that you can actually get into your own work. It doesn't always have to be pen and paper. I was able to construct some mechanisms for my experiments and be able to use them successfully. I always enjoy that physical work part…"

Caring

I asked participants about which aspects of the program affected the caring support they felt from others. A consistent theme here was peer and mentor support, both through listening and responsiveness. Keegan shared:

> It was interesting to see how everyone was helpful around here. Because this is a much larger campus than the one back home. So, I didn't think everyone would be as willing

to help, not willing, but I knew they would be busy with other stuff. But, no matter how busy my mentors or my graduate students were, they were always willing to help. And, then and everyone else in the group also was always willing to help.

Cameron described his experience with a graduate student who was also working on a project in the following way:

> He would always glance over my work. He was obviously busy with his own work associated with my experiments. Whenever I had a question, I was able to get a good response from him and be able to apply to my work. [M]y mentor always leaves his office door open, so whenever I have a question that perhaps my grad student won't be able to answer, I can always go to him.

Ralph similarly responded to this question by reflecting on time spent with one of the graduate students in the lab:

> …when we were working on abstracts, like my postdoc actually sat aside and went through it and he helped me pick parts out, and annotate areas of that.

A few other responses to this question included a general sense of surprise that faculty, staff, and graduate students were so willing to help. As Keegan explained,

> It was interesting to see how everyone was helpful around here because this is a much larger campus than the one back home. So, I didn't think everyone would be willing to help, not willing, but I knew they would be busy with other stuff. But, no matter how busy my mentors or my graduate students were, they were always willing to help.

Erin responded in the following way:

> I felt a lot of support from my graduate students. They were actually both undergrad students here. One was a senior this year and the other one was my level that I will

transfer at. I felt a lot of support. I was with them most days. I worked very few times alone in the lab. I think it really helped reinforce my ideas and my comfort level. Having someone around with me who had more experience. And, my mentor was always around to give advice and to help me, so I felt very comfortable and I felt that it was a very healthy environment.

Effort

The second interview question asked participants to describe their level of effort in the summer program and most participants indicated their effort matched their level of commitment to the program. Erin expressed how she worked on her research every day in order to "be enriched by this program to its full extent." Cameron described his effort as "sufficient to accomplish many tasks." In examining time spent on task, all participants were required to spend the same quantity of time on task in order to finish their project by the deadline. While I received responses that consistently suggested every participant felt their effort was sufficient for the task, some of the other descriptive responses to this question reflected on the dilemma of balancing work with other social activities available throughout the program. As Ralph who chose to express his effort as a 7.5 on a scale of 1 to 10 summed it up by stating,

> Overall, there were times when I was putting more effort into socializing and times when I was really hustling and trying to learn and take in the research environment while creating a final product for the symposium, this is why I scored my effort at a 7.5.

Brianna described her effort in the following way:

> I put my best effort into this program and will continue to put my best effort into my research….I also worked on my poster over a span of two weeks and practiced my talk at Least six or so times.

Cameron who used the adjective "sufficient" to describe his effort went on to characterize his effort thusly:

> I believe I was able to meet the expectations set before me and I had an enjoyable responsibility to do so but also because I like to do these kinds of work and presentations. Although there were areas that I can definitely improve, I still tried my best to produce the best results I could.

Mary described her effort by saying,

> I put a lot of effort into the summer program. I put so much effort because I found it was something I liked and was interested in….I even came on the weekends (not going over the 40-hour limit) to do more lab work….

Erin who plans to major in systems biology shared.

> I worked every day on my research this summer, whether it was attending lab, drafting my PowerPoint and poster presentation, or researching my topic. I truly wanted to learn and be enriched by this program to its full extent.

Again, all of the participants indicated their effort was enough to achieve the desired outcome which was to produce a body of work that could be presented and discussed as a poster presentation and as a PowerPoint supported talk with follow-up questions from listeners.

Mixing Results

I mixed the results of the qualitative and quantitative data in the final step in order to achieve triangulation and more fully understand the findings in both the qualitative and quantitative sections related to the first research question. I discuss the results of this mixing in the next section.

Chapter 5: Discussion

This study examined the relationship between a summer research program experience and community college students' science-related self-efficacy, science identification, and science-related goals. This chapter includes a discussion of the major findings and their relationship to the motivation constructs examined in the literature.

Summer Program Influence on Science Self-Efficacy, Identification, and Goals

The first research question was: What is the influence of a summer program on community college transfer students' science-related self-efficacy, science identification, and science-related goals? The results of the study answer this question and suggest that the program components had a positive effect on students' perceptions of each of the three constructs.

Science-Related Self-Efficacy. Participants reported higher values for their confidence (i.e., self-efficacy) related to being a successful student in science at the end of the program than at the beginning. The quantitative results showed that participants reported increased self-efficacy in their abilities to complete science-related activities (*M* improved from 3.57 to 3.71); this increase spanned abilities such as creating a plan for a research project, problem solving, explaining technical ideas, and completing a literature review. While the number of participants were not enough to statistically compare the pre- and post-scores, the post-scores were higher. I speculated this increase might be due to gains from mastery experiences participants gained in the summer program because Bandura's (1977) self-efficacy theory predicts that self-efficacy increases when individuals achieve mastery experiences. For the participants in this study, these experiences included required science training specifically related to how to conduct research. Additionally training on how to conduct research and prepare for discussions and presentations related to the research project were also embedded in the program. Weekly professional development activities required them to navigate the academic and career aspects of science. Participants routinely interacted with peers and graduate students participating in the summer program which allowed them to practice what they learned across the span of the program.

The qualitative interviews support this finding as participants like Ralph and Cameron expressed how their confidence in their ability to be successful in science was reinforced by their experiences in the program. It is impossible to know which specific experiences directly contributed to participants' feeling more efficacious in regards to scientific research activities based on the data collected this study.

A slight decrease was noted in participants' post-survey confidence responses to the item related to having a successful career in science (*M* decreased from 4.86 to 4.57), but this change was directly contrasted by many of their personal reflections collected and analyzed in the qualitative portion of my research. I speculated that participants may have felt more confident about their abilities to succeed academically because they worked alongside, and were supported by, peers and graduate students currently enrolled at the host university. The regular interactions between participants, other summer research students, and the program mentors positively affected their confidence levels and persistence based on their personal assessments of how their performance across the program compared with others working on the same or similar projects which connects with what is known about the social comparative nature of self-efficacy (Bong & Skaalvik, 2003). The opposite effect may have occurred through their interactions with their faculty mentors whose research achievements may have seemed more out of reach for participants based on their personal assessments of their abilities measured against that of an expert. All participants were asked to review the professional profiles of their mentors, and some participants were required to read research articles published by their faculty mentor. As a result, the participants who focused on the career accomplishments of their mentors in comparison with personal circumstances may have felt less confident in their ability to have a successful career in science based on these comparisons. While not captured in this study, those comparisons may have included social and economic comparisons as well. As an example, none of the mentors attended community college, so this information may have changed participants perceptions of what they could achieve based on their chosen path that began at community college.

Self-efficacy is impacted by different types of experiences, including mastery, vicarious, verbal, and emotional reactions (Bandura, 1977). I learned from the interviews with participants that their ownership of their research experience grew over the course of the experience as they went from observing their peers at work, practicing and assisting at times, performing assigned tasks, receiving feedback, and working more independently on their research.

While the scope of this program is limited to 10-weeks and data was collected before and after the program, a study of a similar enrichment program found that increased science self-efficacy may continue for extended periods of time beyond the original program experience (Linnebrink-Garcia, et al., 2018). The researchers in that study found that the increased science self-efficacy was still evidenced eight months after the program. This is important because it is likely that students in this population who transfer to a university in a STEM major will change to a non-STEM major before graduation (Anderson & Kim, 2006; Elliott, Strenta, Adair, Matier, & Scott, 1996: Tsu, 2007; U.S. Department of Education, 2000). Based on the increased self-efficacy of the participants, I surmised they will be less likely to change to a non-STEM major after transfer due to the positive change in self-efficacy.

Science-Related Career Goals. In the area of science-related career goals, participants rated their level of interest in science-related careers using a 5-point Likert scale ranging from 0 (*not at all interested*) to 5 (*extremely interested*). Although their interest in pursuing careers as health care professionals increased, their interest in teaching at almost every level, except the university, decreased. The mean score for their interest in becoming a health care professional or nurse increased from a *M* of 4.57 in the pre-program surveys to 5.00 post-program. When it came to teaching, their scores decreased from a *M* of 2.43 pre-program to *M* of 1.86 post-program related to teaching at a high school and from a *M* of 2.86 pre-program to *M* of 2.14 post-program also in the area of teaching science at a community college. There was no difference in M scores reported for interest in teaching at a university; they were consistently at a *M* of 3.00 both pre- and post-program. These quantitative findings were supported by the qualitative interviews in which the majority of participants remained committed to the science-related career path they identified in the surveys for which none had expressed an interest in teaching.

The results demonstrated a positive relationship between science self-efficacy, science identification, and science-related career goals. When asked to report the extent of agreement or disagreement related to attending graduate school in science using a 5-point Likert scale, I recorded a *M* of 3.86 pre-program and a *M* of 4.29 post-program. These findings are supported on the qualitative side in many of the participants' responses to the interview, including one who said, "I understand my research a lot better, on more of a personal level, if that makes sense." Another participant explained feeling more confident that she wanted to work as a researcher in neuroscience. As it relates to usefulness in the MUSIC model, the participants each described how the program allowed them to think about and discuss their career goals with faculty, graduate students, and their peers in the program. This had the result of allowing them to make more informed choices about their next steps in their academic experience, whether to remain in science or to explore other areas. All participants expressed a commitment to continue towards a science degree after completing the program. These findings support a connection between the program components and participants' identification with science and science-related goals.

Relationship Between Participants' Perceptions and Effort

The second research question I explored was: How did community college transfer students' perceptions of a summer program affect their effort in the program? The results of this study demonstrated that the majority of students had positive MUSIC perceptions of their experience and this was reflected in their sustained effort for the duration of the program. These findings are consistent with the MUSIC model theory in which effort (as a measure of behavioral engagement) increases as one or more of the MUSIC components increases (Jones, 2009, 2018).

MUSIC model and Summer Program Design. My analysis of the qualitative data demonstrated that participants' reported high levels of all five components of the MUSIC model in one or more instructional components of the program. Participants perceived *empowerment* in their ability to control certain aspects of the program, such as time, research design, and presentation style. The majority of participants expressed feeling empowered, and they identified and described specific instances such as realizing their input about scientific research was welcomed. While they received guidance from their faculty mentor, participants indicated they maintained control over portions of the project, and some indicated they were allowed to work independent of their mentor and graduate students as they demonstrated their ability to do so. While much like any job, they had deadlines, it was up to the participants to determine how best to achieve the outcome. The result of *usefulne*ss was demonstrated in participant reflections about how their experiences in the program helped them to explore and refine their science-related academic and career goals through practical experience as well as discussions with practicing professionals in the field *Success* was evidenced in discussions where participants described being able to keep up with other undergraduates as well as those participants who gained more confidence about their abilities based on the feedback received from the program directors. The majority of the participants expressed that their *interest* in the program was maintained due to the alignment of the project with their personal interests. Additionally, the ability to function as a researcher for the summer was important for many. The final component of the MUSIC model, *caring*, was present in their discussions about the other four components of the MUSIC model, as students described how much support and guidance they received in the program.

The presence of the MUSIC model components and their relationship to the participants is significant because it aligns with similar findings from Jones, Osborne, Paretti, and Matusovich (2014) who explored and identified a positive relationship between the MUSIC model components and students' motivational beliefs, effort, and academic outcomes in an engineering course. I suggest the presence of the MUSIC components are a strong indicator that students in this program will be successfully engaged and retained in their major. Other studies have noted increases in the areas of science self-efficacy, science identification, and effort support research on the positive impact of summer enrichment and bridge programs on academic success and persistence (Hunter et al, 2006; Kuh, 2008; Laursen, 2010; Pascarella & Terenzini, 2005).

The presence of the caring construct in the current study is in contrast with findings of Townsend and Wilson (2006) in which community college students felt a lack of connection to the university due to limited instances where faculty and university staff showed actions that indicated they cared about this population. The participants in the present study were able to integrate into the university research community by living on campus with other students and by engaging with faculty and peers during this program. These instances of caring also provided a network of faculty and students available to help the students.

Implications for Universities

The President's Council of Advisors in Science (2012) indicated that less than 40% of students who begin college with an interest in a science or STEM degree select and persist in that area until graduation. Many will graduate with a non-STEM degree. The low persistence rate noted across the literature builds support for programs such as the one in this study which was designed to increase participants' motivation to pursue degrees and careers in science. Students were given an opportunity to feel what it is like to spend several weeks working and thinking like a researcher. This type of introduction to science, which included instructional components paired with hands on experience, gave participants a unique opportunity to see how the academic and professional components intersect in a career. While the purpose of this study did not include tracking students beyond the scope of the summer program, the outcomes showed positive indicators that the students would persist in their intentions related to science after transferring to the university. The program in this study was intended for transfer students only; however, similar programs might be offered to other students who are interested in, but undecided about, pursuing a science major and related careers.

The structure of this program allowed participants the opportunity to meet and establish lasting relationships with faculty and graduate students in their area of academic interest. This is important because we learned from research based on student development models like Tinto's

(1993) and Astin's (1977, 1993) that the level of interactions, engagement, and integration are significant factors in student retention (Ackerman, 1991; Garcia,1991; Gold, Deming & Stone, 1992; McElroy & Armesto,1998; Pascarella & Terenzini, 2005). As participants in the current study noted, they got to know their faculty mentors and felt comfortable asking questions and interacting with faculty.

The participants in this study met the definition of underrepresented as defined by the sponsoring program, and use of this descriptor was not designed to make a larger statement about more widely accepted definitions of the term. Universities might consider ways that the instructional strategies and components of this program could enhance institutional support for underrepresented populations considering a science program.

Another positive implication of the program was that it mitigated concerns related to lack of caring and engagement noted in research on transfer student experiences (Allen, 1992; Brown, 2000; Cole, 2007; May & Chubin, 2003; Tsui, 2007). This also supports the caring and success components of the MUSIC model. Although the faculty mentors were not interviewed for this study, most had experience working with this type of program and were able to direct their mentees toward projects that were manageable based on the time allowed. The findings showed that participants all felt they could be successful very early on and that feeling was maintained throughout the program. Similar programs should consider strategies to match the research project with the students' skills.

Implications for Career Development

This program worked well for motivating students to continue on academic and career paths in science; however, the current program focused on motivating students to consider research-based careers in science. Another question is what are ways the program could also explore careers outside of those in research? As an example, the results showed that students were not interested in careers related to teaching, especially at the high school level. A similar program might collaborate with high school teachers to show what that experience is like as a career. Additionally, this type of program might be revised to include more instruction related to career exploration.

Additional research might follow up with the participants to see if they persist until degree completion at the university. This is important because while the program had professional and academic development components, more activities might be added on the academic development side in place of the major concentration on preparing students for graduate school, specifically taking the GRE. A closer look at how these students perform academically across their time at the university would help program designers determine whether the program should include more information about how to prepare for the first-year's curriculum at the university, especially given that many students see a significantly lower GPA in their first semester after transfer.

Administrators of similar programs should consider how the program affects students' MUSIC perceptions. As noted in the current study, all five components of the MUSIC model were identified by participants and were related to important outcomes and effort in the program.

Limitations and Future Research

This study was based on a small sample (n = 7) of students who enrolled in a university-specific program; therefore, the results may not be generalizable to students in programs at other universities. This study was based on information received from seven students who represented three community colleges with populations identified as underrepresented or underserved in areas to include biomedical and life sciences. Many of the students were aware of the program before applying, and one student had completed the transfer process at the time of the study. These components make the results less generalizable.

Another limitation was the unanticipated smaller number of students who completed the study. The program typically enrolled 10 students; however, only eight attended, and seven completed all parts of the study. The larger number may have yielded different results; however, the additional participants would have also come from the same community colleges, so their perspectives may not have changed the results in any significant way.

Future Research

Future research on this topic might look at programs like this across multiple universities to see if the findings are similar. A longitudinal study that follows and checks in with program participants periodically during their time at the university and 1 to 2 years beyond graduation would allow researchers to determine if participants followed their stated goals.

Conclusion

The current study contributes to the literature related to strategies to improve community college transfer student motivation in science. The findings suggest that transition or student programs that allow participants to explore what it feels like to work as a scientist are conducive to motivating students to believe they can succeed in a science major. This study provides evidence that the instructional components of the summer program increased transfer students' science-related self-efficacy, science identification, and science-related goals. The findings of this study are consistent with the MUSIC Model of Motivation theory in that increases in students' effort were associated with their increased perceptions of the MUSIC model components.

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(Appendices)

Appendix A: Post-Survey, Semi-structured Interview Questions adapted from the MUSIC Inventory (Jones, 2017)

eMpowerment

- What aspects of this program affected how much control you had during the program?

Usefulness

- What aspects of this program affected how useful the program was to your academic and career goals?

Success

- What aspects of the program affected your beliefs about whether you could succeed or not as you progressed through the experience?

Interest

- What aspects of the program affected your interest and enjoyment in the program?

Caring

- What aspects of the program affected the caring support you felt from others?

Appendix B: Interview #1 Protocol and Questions

Thank you so much for participating in my study. I appreciate your taking the time to meet with me today. Before we begin the interview, I want to tell you about the purpose of my study and to share with you the types of questions I will be asking you. Also, I want to explain how your information will be used and what steps I will take to maintain your confidentiality.

Purpose of today's interview

I am interested in your background as a community college transfer student. This study will examine your experiences in the Science in Transition program program and seeks to understand how the program may have impacted your beliefs and goals as a student. Today's conversation will allow me to understand your background before participating in the summer program.

Confidentiality

Your information will remain confidential at all times. I will assign you a pseudonym to protect your identity.

Recording

I want to be certain that I fully hear everything you say to me during the interview and with your permission, I would like to digitally record our meeting. I will have the recording transcribed by a professional who will listen and type out what has been recorded while maintaining your privacy as directed by a contractual agreement. Your confidentiality will be maintained and the typed transcript will be kept in a locked box in my home at all times when I am not reviewing it. I will share summaries of the transcripts if you would like at a future date if you are interested. If you are comfortable proceeding at this time, I will begin recording once I have your signed consent.