EXPLORING THE ROLE OF STUDENT ORGANIZATIONS IN THE PERSISTENCE OF WOMEN IN STEM ASSOCIATE DEGREE PROGRAMS

by

Zackary Tyler Hubbard

An applied dissertation submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Doctor of Education in
Educational Leadership

Charlotte

2024

Approved by :

_____
Dr. Ayesha Sadaf

_____
Dr. Jae Hoon Lim

_____
Dr. Ryan Miller

_____
Dr. David Pugalee

ABSTRACT

ZACKARY TYLER HUBBARD. Exploring the Role of Student Organizations in the Persistence of Women in STEM Associate Degree Programs. (Under the Direction of DR. AYESHA SADAF)

This dissertation explores the impact of student organizations on the persistence of women in STEM programs at the associate degree level. The findings reveal that participation in SkillsUSA provides students with valuable opportunities for hands-on learning, skill development, and career exploration, all of which contribute to the persistence of the participants in their chosen STEM related field. SkillsUSA offers a range of activities, including competitive events, leadership development, and community service projects, that foster collaboration, communication, and problem-solving skills among students (Maldonado & Jaeger, 2021; *SkillsUSA Championships (Career Competition Events) - SkillsUSA.Org*, n.d.; Threeton & Pellock, 2016). SkillsUSA can serve as a bridge between classroom instruction and real-world application, allowing students to apply their knowledge in authentic settings and gain practical experience in their chosen fields.

This study utilized a qualitative research design, drawing on data from semi-structured interviews with women enrolled in STEM associate degree programs who are active participants in SkillsUSA, a focus group of women in STEM, observations of SkillsUSA events, and a review of relevant documents produced by the SkillsUSA national and state organizations. Interview questions focused on participants' experience with SkillsUSA, the support they received from the organization, and how their involvement influenced their academic and career decisions. Thematic analysis was employed to identify key themes and patterns within the data.

Key themes that emerged from the data include the importance of mentorship, peer support, and extracurricular student engagement in shaping student's academic and career trajectories. The participants of this study expressed gratitude for the guidance and encouragement provided by their SkillsUSA advisors and mentors, as well as the importance of the sense of camaraderie they developed with other women who were working to pursue a STEM career. Overall, this dissertation underscores the significance of Career and Technical Student Organizations like SkillsUSA in enhancing the quality and relevance of CTE programs and preparing students for an ever-evolving workforce. The findings contribute to our understanding of the impact of co-curricular activities on student outcomes and the persistence of students who opt to participate in SkillsUSA.

ACKNOWLEDGMENTS

This project would not have been possible without the support of numerous SkillsUSA advisors in the southwest region of North Carolina. Their assistance in recruiting participants and providing documents for review helped to ensure the successful completion of this study. I would also like to express my sincere gratitude to the members of my dissertation committee for their invaluable support and guidance throughout the writing process. I am especially thankful to Dr. Ayesha Sadaf, my dissertation chair, for her unwavering commitment, expertise, and encouragement. Her guidance and feedback have been instrumental in shaping this dissertation and navigating the complexities of the research journey. I would also like to acknowledge the faculty of the Educational Leadership department at the University of North Carolina at Charlotte for their support and resources that have facilitated my research endeavors.

DEDICATION

This study occurred during a rather difficult time in my life and represents over eight years of learning and growth for me both personally and professionally. Shortly after enrolling in the EdD program at UNCC, I experienced several major flares of Crohn's disease. This diagnosis led to numerous treatments, medications, and a surgery that made this period more difficult than I anticipated. I would not be at this point without the support of my family, who showed me unwavering love, encouragement, and understanding during this challenging yet rewarding journey. Their belief in my abilities and steadfast support have been the driving force behind my resilience in the face of several health-related struggles. I would like to especially acknowledge my husband, Dr. Corey McNeill for his support along this journey. His patience and support made it possible for me to push through so many challenges over the past decade.

TABLE OF CONTENTS

LIST OF TABLES xii

LIST OF FIGURES xiii

LIST OF ABBREVIATIONS xiv

CHAPTER 1: INTRODUCTION 1

Overview of Literature 1

Purpose and Research Questions 5

Methodology 5

Research Site, Participants, and Data Collection 6

Significance of the Study 7

Limitations 9

Definition of Terms 10

Summary and Organization of the Study 11

CHAPTER 2: LITERATURE REVIEW 13

Motivations for Career Choice 15

Barriers to the Recruitment of Women in STEM 16

The STEM Pipeline 18

Facilitators to the Recruitment of Women in STEM 19

The STEM Pipeline 20

The Role of CTSOs 21

Barriers to the Retention/Persistence of Women in STEM.....22

The Role of Faculty and Staff.....22

The Role of CTSOs.....24

Facilitators to the Retention/Persistence of Women in STEM.....25

The Role of Faculty and Staff.....27

The Role of CTSOs.....29

The Role of STEM Related Student Organizations in Retention and Persistence.....32

Summary.....33

CHAPTER 3: METHODOLOGY.....35

Research Design.....35

Research Questions.....35

Role of the Researcher and Positionality.....36

Research Site and Participants.....38

Research Site.....38

SkillsUSA Events.....39

Participant Selection.....39

Participant Recruitment.....40

Data Collection.....41

Semistructured Interviews.....42

Document Review.....42

Focus Group 43
Observations 44
Data Analysis 45
Ethical Considerations....47
Strategies for Data Quality....49
Summary 50
CHAPTER 4: FINDINGS 52
Description of Participants....53
Alignment of Themes and Subthemes 54
Research Question One 55
Benefits of SkillsUSA Beyond the Classroom....55
Institutional Support 57
Academic Impacts 58
Academic Major Decisions 59
Retention....63
Role of Coursework....65
SkillsUSA In the Classroom....66
Research Question Two 67
Competition 67
State Level Events Facilitated Connections and Friendships....70

National Level Events 71

Job and Career Implications 74

Career Goals 75

Internship Experiences 77

Research Question Three 78

The Importance of Relationships 78

The Role of the Instructor/Advisor 79

Peer Relationships 82

Extra-Curricular Nature of SkillsUSA 84

SkillsUSA as a Club 84

Chapter and School Pride 86

Community Service 87

Cost and Financial Implications 89

Suggestions for the Future 90

Conclusion 92

CHAPTER 5: DISCUSSION 93

Summary of Findings 94

Discussion of Findings 94

Alignment with Scholarly Literature 96

The Theory of Institutional Departure 97

Socio-Academic Integrative Moments 98

Key Experiences of Participants 99

Limitations of the Study 100

Implications for Professional Practice 101

Recommendations for Future Research 102

Summary 104

Concluding Remarks 105

REFERENCES 106

APPENDIX A: INFORMED CONSENT FORM (INTERVIEW) 121

APPENDIX B: INFORMED CONSENT FORM (FOCUS GROUP) 124

APPENDIX C: INTERVIEW GUIDE 127

APPENDIX D: FOCUS GROUP DISCUSSION GUIDE 129

APPENDIX E: OBSERVATION PROTOCOL 130

LIST OF TABLES

Table 1: Participant Information 53

Table 2: Alignment of Themes and Subthemes with Research Questions 54

LIST OF FIGURES

Figure 1: SkillsUSA North Carolina Regions 39

LIST OF ABBREVIATIONS

ATE	Advanced Technological Education
CTE	Career and Technical Education
CTSO	Career and Technical Student Organization
HVAC	Heating, Ventilation, and Air Conditioning
LLC	Living-Learning Community
NCCCS	North Carolina Community College System
NSF	National Science Foundation
STEM	Science, Technology, Engineering, and Mathematics

CHAPTER 1: INTRODUCTION

This study explored the influence of an on-campus STEM related student organization (SkillsUSA) on the persistence of women in STEM related Associate in Applied Science degree programs at public two-year community colleges in central North Carolina. A qualitative case study approach was used to complete this study. This approach was chosen to capture in-depth descriptions of participation in a student organization whose mission is to support students in engineering and industrial technologies, and how participation may relate to their persistence in STEM programs. The lack of existing knowledge around the role of student support organizations at the two-year level is an obvious gap in the literature that will be explored further in this study. Results from this study can be used to better understand the impact of support organizations for women in STEM and how they may be used to influence the persistence of those students.

Overview of Literature

In 2011 The Office of the Chief Economist of the United States reported that men made up 52% of the workforce, however they held as many as 76% of science, technology, engineering, and mathematics (STEM) related jobs that existed that year (Beede et al., 2011). This report was created out of census data that was collected in 2010, which was not replicated during the 2020 census. A growing number of jobs in the U.S. are being created in STEM fields, and job growth in these fields are often categorized as the future of the economy (A. M. Camacho & Lapuz, 2014; Choi, 2022; DeAro et al., 2019; Griffith, 2010; Han, 2016; Langdon et al., 2011; Marksbury, 2017). The Department of Commerce correctly estimated that STEM jobs would grow by 17%

from 2010 until 2017, while all other employment growth settled around 9% (Blackburn, 2017; Langdon et al., 2011; Mullet et al., 2017; Xu, 2017). Statistics like this support the belief that to provide the best income, job stability, and growth opportunities, women must be able to take advantage of this growing career field.

Herman et al. (2017) found that dropout rates are significantly higher among women students in STEM majors compared to the majority of other majors, and many students who are STEM majors decide to dropout in the first two years of college. One research study examined the long-term benefits for women who participated in a STEM living learning community were significantly more likely to receive an undergraduate degree, and nearly three times as likely to pursue a masters' degree (Maltby et al., 2016). Of the many positive experiences that are often associated with a living learning community, perhaps the most compelling are the reported significance of a strong community of peers and women role-models and the role they play in student success (Wickersham & Wang, 2016; Xu & Webber, 2018).

During the academic year of 2010-2011, the inaugural White House summit focusing on community colleges took place, comprising four regional gatherings. The primary aim was to identify and adopt effective strategies to enhance community college graduation rates (White House, 2011). Dr. Jill Biden, a community college educator, emphasized in her opening address that "Community colleges stand at the forefront of the nation's endeavor to enhance our economic prospects through education" (White House, 2011, p. 12). Dr. Biden highlighted that community colleges constitute the most rapidly expanding sector in higher education, predominantly due to their affordability (Brandt & Hayes, 2012; Hoffman et al., 2010). Over the past three decades, college tuition has

escalated fourfold compared to the cost of living, with an average annual tuition of $7,000 for public 4-year colleges and $22,500 for private 4-year institutions, contrasting with an average of only $2,500 per year for community colleges (White House, 2011). Many women embark on their STEM career paths at community colleges owing to factors such as convenient locations, smaller class sizes, and greater diversity compared to traditional four-year colleges (Brandt & Hayes, 2012; Hagedorn & Purnamasari, 2012; Hoffman et al., 2010; Packard & Jeffers, 2013). Notably, community colleges frequently offer childcare services, potentially explaining why 62% of women with children commence their education at such institutions (Hagedorn & Purnamasari, 2012; Jackson & Laanan, 2011). Moreover, community colleges are deeply integrated into their local communities and often collaborate with nearby businesses to cultivate a skilled workforce (Hagedorn & Purnamasari, 2012). Lastly, community colleges play a crucial role in preparing students for transition to 4-year colleges (Hagedorn & Purnamasari, 2012; Hoffman et al., 2010; Jackson & Laanan, 2011; Labov, 2012; Rodriguez et al., 2017).

Largely motivated by the increasing need for STEM talent in the labor market, much research has been devoted to discovering the social, socioeconomic, and individual factors around STEM participation (Diekman et al., 2010; Le & Robbins, 2016). A major focus of this research has centered around the factors that determine one's early decision to pursue a STEM education and career (Diekman et al., 2010; Edzie, 2014). Le and Robbins (2016) found that the development and prediction of quantitative ability and interest fit are similar for both men and women which seemingly suggests that they can both be useful in helping to identify future STEM students at an early age. Once

identified, many types of supports can be put into place to help future STEM students continue towards degree attainment and career satisfaction. Much of the research on supports demonstrate the effectiveness of women role models, the availability of advanced science and math coursework in high school, and extracurricular activities throughout secondary education (Herrmann et al., 2016; Hoepner, 2010; Leavey, 2016).

Perseverance of women in STEM has been linked to a strong science identity and extracurricular learning activities, such as involvement in student organizations, can aid in retention as well as in the development of a strong science identity (Blickenstaff, 2005; Rodriguez et al., 2017; Sarseke, 2018; Tinto, 1993; Xu, 2017). Much of the research on retention and persistence of women in STEM degree programs has shown that engagement with the institution and participation in extracurricular activities is key to the rate at which women students complete their degree programs (Maltby et al., 2016). For example, Maltby et al., (2016) examined the long-term benefits for women students who participated in a STEM living learning community and found that they were significantly more likely to receive an undergraduate degree, and nearly three times as likely to pursue a masters' degree. Similarly, involvement in Career and Technical Student Organizations such as SkillsUSA at the high school level, has been found to provide benefits to students' achievement and educational attainment for female and racial minority groups. (Aragon et al., 2013a). Studies involving living learning communities are conducted at residential four-year colleges and universities, and much of the research on Career and Technical Student Organizations is positioned at the high school level (Aragon et al., 2013a; Maltby et al., 2016). This study explored extracurricular student organizations at non-residential community colleges where little research currently exists.

Purpose and Research Questions

The purpose of this qualitative case study was to explore the influence of on-campus STEM related student organizations on the retention of women in STEM programs and capture the perceptions of women who participated in a student organization intended to support the retention and success of women pursuing a STEM related degree at the community college level. A qualitative case study approach was used to complete this study. This approach was chosen to capture in-depth descriptions of participation in a student organization from the point of view of the student. The following research questions guided this study:

1. What aspects of participation in SkillsUSA are the most impactful for women in STEM?
2. How do women in STEM perceive the role of SkillsUSA in their persistence in STEM programs?
3. What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM programs?

Methodology

The goal of this study was to explore the influence of on-campus STEM related student organizations on the retention of women in STEM programs. This type of inquiry lends itself to qualitative research, and it aligns well with the concept of a case study. A case study design was chosen as it is often appropriate when the unit of analysis can be described as an "event, program, activity, or more than one individual" (Creswell, 2013, p. 104). The study allowed for development of descriptions relating to student organizations in a higher education setting, especially in the case of a specific group such

as women majoring in a STEM related field who participated in SkillsUSA. Similar to other types of qualitative research, qualitative case studies position the researcher as the main instrument for data collection and analysis, employ an inductive strategy of investigation, and allow the researcher to develop findings that are richly descriptive in nature (Merriam & Tisdell, 2015).

This singular methodological approach helped focus the data collection and allowed for the exploration of the topic of student organizations for women in STEM from an in-depth perspective. Interviewing students who provide rich and holistic descriptions of experiences with the student organization provided the information needed to choose the optimal means of increasing the effectiveness of student support organizations for women in STEM. To further enhance the data, a focus group was used to add richness to the data that was collected, in addition to a document review process that examined relevant artifacts from the SkillsUSA organization. The chosen methodology was positioned with current research from the literature review to provide insights into professional practice recommendations to help support women in STEM.

Research Site, Participants, and Data Collection

This research was conducted through the SkillsUSA chapters present at public two-year community colleges in the Southwest Region of North Carolina as defined by the SkillsUSA organization. SkillsUSA is a STEM focused student organization whose overall mission is to ensure that America has a skilled workforce (Maldonado & Jaeger, 2021; Threeton & Pellock, 2016). In addition to ensuring that America has a skilled workforce, the organization also emphasizes the retention of women in STEM related fields. The organization involved in this study has faculty advisors that are involved in

the extracurricular activities of the participating students. It is important to note that the researcher has served as an advisor in this capacity in the past but does not currently serve in that role. The participants of this study met the following criteria: (1) at least 18 years old; (2) was enrolled in an engineering or industrial technology focused AAS or AE degree; (3) was an active participant in a chapter of the SkillsUSA student organization for at least one full 16-week semester; and (4) possessed plans to enter the workforce or transfer to a university at the conclusion of their current degree.

This study was guided by the research questions and data was gathered through semi-structured interviews, observations of SkillsUSA competition events, document reviews, and a virtual focus group, with women who are community college students and fit the context of this study. Interviews, observations, and a virtual focus group were conducted with students who are in the second year of the Associate in Engineering transfer program or a STEM related Associate in Applied Science degree at a community college in North Carolina, that have also participated in SkillsUSA. The transcribed data from the interviews, focus groups, and observations in this study were analyzed to identify common themes, experiences, or events that positively contributed to the student's success in their academic program, as well as traits that led to persistence into their second year. Common themes and general answers to the questions were used to codify the data.

Significance of the Study

Much research has focused on the impact of extracurricular clubs and organizations at traditional four-year residential colleges and universities (Behrendt, 2017; Case, 2011; Foreman & Retallick, 2013; Tinto, 1990, 2012; Wessel et al., 2003).

Community Colleges, who are most often categorized as non-residential two-year institutions, have not been a significant focus of research around extracurricular involvement and it's impacts on retention or academic performance (Hagedorn & Purnamasari, 2012; Jackson & Laanan, 2011; Karp et al., 2008). As demand for skilled STEM technicians and transfer students has increased over the past two decades, community colleges are increasingly looked upon as a potential solution to augment the STEM talent pipeline (Beede et al., 2011; Hagedorn & Purnamasari, 2012; Heybach & Pickup, 2017; Savaria & Monteiro, 2017; White House, 2011).

Since community colleges do not have the ability to offer retention interventions that are residential in nature, they most often rely upon extracurricular organizations to fill the role that is most often done in living-learning communities at the university level. By capturing in-depth descriptions about the experience of involvement in SkillsUSA, helpful insights and best practices emerged and worked to provide powerful insight for community college administrators who are hoping to support their students with extracurricular activities. Many Career and Technical Student Organizations (CTSOs) have a focus on retaining and supporting students in identified special populations, such as women in STEM fields (Aragon et al., 2013a; Castellano et al., 2011). SkillsUSA has emerged as one of the largest and most active CTSOs in the nation with students from all 50 states and chapters in two thirds of the community colleges in the US (Reese, 2003). This study produces descriptions from the point of view of the student about the benefits and impacts of the student organization.

Limitations

This study has several limitations. First, the study sought participants to volunteer for interviews and a focus group. Participants who volunteer for interviews and focus groups may not be representative of the population of students enrolled in the program as a whole. Additionally, these students have also volunteered to participate in the student organization as well. Any benefits that are discovered from participating in the student organization may not be applicable to all students unless they are also willing to voluntarily participate in the student organization. The possibility of researcher bias does exist considering that this study was conducted by one primary researcher, and issues around power and context were minimized where possible. The sample and scope of this study could limit the transferability of the results. By choosing a national student organization such as SkillsUSA, the study is able to provide insight that would be recognizable by as many other community colleges as possible.

Another important factor for consideration is the curriculum itself. There are many aspects of curriculum design in North Carolina that are left up to the individual colleges. It is possible that the same degree at different colleges could contain different courses and that the faculty may have different interpretations or impressions of career and technical student organizations such as SkillsUSA. Additionally, there are marked differences between different regions of the state, and it is possible that career and technical education in general could be defined differently based on those regional differences. In the piedmont region, programs often work with the Centralina Workforce Development Board to provide internships and training related to SkillsUSA topics that

supplement the organization. This may be a completely different experience for students who live in the coastal or mountain regions of the state.

Definition of Terms

CTSO: Career and Technical Student Organization. Currently there are 8 CTSO's at the secondary and collegiate levels which include Business Professionals of America (BPA), Distributive Education Clubs of America (DECA), Future Business Leaders of America (FBLA/PBL), Family and Community Leaders of America (FCCLA), Future Farmers of America (FFA), Health Occupations Students of America (HOSA), SkillsUSA (formerly Vocational Industrial Clubs of America), and Technology Students of America (TSA) (Threeton & Pellock, 2016).

LLC: Living-Learning Community. Specialized living environments that connect students inside and outside of the classroom through extra-curricular activities and deliberate placement of roommates by shared degree goals (Maltby et al., 2016).

NSF: National Science Foundation. A government entity established in 1950 to promote nonmedical scientific endeavors; it is the largest source of funding in STEM fields (James & Singer, 2016).

SkillsUSA: A Career and Technical Student Organization that provides professional development for students enrolled in engineering and industrial technology related degree programs focused primarily at the community college level.(Threeton & Pellock, 2016).

STEM: An acronym for the collective subjects of Science, Technology, Engineering, and Math (Clark et al., 2018; Diekman et al., 2010; James & Singer, 2016; Maltby et al., 2016).

STEM Pipeline: A term used to describe the means by which STEM workers are trained and allowed to enter the workforce. This can be viewed in terms of education, training, and early childhood preparation (Le & Robbins, 2016).

Summary and Organization of the Study

Due to the underrepresentation of women in science, technology, engineering, and math constituting a major issue in postsecondary engineering education, recent research has explored retention and persistence of women who are enrolled in a STEM related program (Beede et al., 2011; Blickenstaff, 2005; Choi, 2022; Heybach & Pickup, 2017; Maltby et al., 2016; McFarland et al., 2018; Sarseke, 2018; Savaria & Monteiro, 2017; Su et al., 2015; Wilson-Kennedy et al., 2019). While much of that research has revolved around faculty-student relationships, participation in learning communities, student engagement, and the impact of role models in 4-year baccalaureate degree programs (Savaria & Monteiro, 2017), there are gaps in the literature discussing the impact of student organizations to support women pursuing a STEM related degree at the community college level. This study works to address some of the limitations of previous empirical research on women in STEM fields at the community college level, such as the impact of student organizations on the persistence and retention decisions of the student.

This chapter introduced the issues surrounding women in STEM and developed a foundation for this qualitative case study. Chapter two of this dissertation provides a literature review of retention and persistence related research for women in STEM, while also providing a background of research around Career and Technical Student Organizations and other relevant extracurricular student organizations. Chapter three includes the methodology and qualitative analysis procedures used in this study. Chapter

four describes the findings of the study and presents the data. Lastly, Chapter five discusses the findings as they relate to the literature as well as implications for community colleges to consider on the topic at hand. Chapter five will also include potential directions for future research.

CHAPTER 2: LITERATURE REVIEW

This chapter is divided into six main sections, each containing findings from the relevant literature. The first section discusses motivations for career choice, while the second and third sections discuss barriers and facilitators to recruiting women in STEM. Sections four and five discuss barriers and facilitators to retaining women in STEM. The final section of this chapter outlines the role of student organizations in retention and persistence. In an effort to support the need to fill the gap in the current knowledge on this topic, each section also contains relevant aspects of participation in student organizations demonstrating a lack of research at the associate degree level. Within the six main sections, there are additional topics relating to recruitment and retention on the role of faculty and staff, federal legislative initiatives, and the concept of a STEM pipeline to meet workforce demands.

A great deal of recent research has explored the idea of retention and persistence with regard to women who are enrolled in a STEM-related program (Blackburn, 2017; Choi, 2022; Hagedorn & Purnamasari, 2012; Heybach & Pickup, 2017; Hoffman et al., 2010; Jackson & Laanan, 2011; Labov, 2012; McGee & Bentley, 2017; Rodriguez et al., 2017; Toglia, 2013; Wilson-Kennedy et al., 2019). Much of that research has revolved around faculty-student relationships, participation in learning communities, student engagement, and the impact of role models (Savaria & Monteiro, 2017). The importance of this research is summarized by a report from the Office of the Chief Economist that states that men make up 52% of the workforce, however they hold as much as 76% of STEM related jobs that currently exist (Beede et al., 2011). These statistics occur at a time when a growing number of jobs in the United States are being created in the STEM

fields, and job growth in these fields is often categorized as the future of the economy (Griffith, 2010). The Department of Commerce estimates that STEM jobs will grow by 17% through 2018, while all other employment growth will settle around 9% (Langdon et al., 2011). Statistics like this support the belief that to provide the best income, job stability, and growth opportunities, women must be able to take advantage of this growing career field. The National Science Foundation (NSF) has invested heavily in STEM through their Broadening Participation programs that focus on increasing participation of underrepresented groups such as women and minority students (James & Singer, 2016).

A large factor typically associated with STEM jobs is the potential for higher earnings. After the 2010 census, the Department of Commerce reported that STEM workers typically earn as much as 26% more than workers in other fields (Langdon et al., 2011). This earnings gap is particularly evident at lower levels of education where it is reported that non-STEM workers with only a high school diploma earn up to $9.71 less per hour than STEM workers with the same level of education. These findings decrease as the education level increases and is reduced to a difference of $4.47 between STEM workers with a graduate degree versus non-STEM workers with the same educational background (Beede et al., 2011). The 2020 census report did not release updated pay discrepancy information for STEM fields. However, most evidence reports that this pay gap has stayed roughly the same when inflation is considered (Beede et al., 2011; Choi, 2022; Dougherty & Lombardi, 2017; Xu, 2017).

In terms of pay differences between genders, it is also apparent that there are differences between STEM and non-STEM related fields. The Office of the Chief

Economist reports that non-STEM related jobs experience as much as a 21% gender wage gap; however, that gap is lowered to 14% in STEM related fields. Although 14% is not ideal, a 7% difference is notable for women workers. At 14% the gender wage gap can be perceived as women in STEM earning $0.86 for every dollar that a man earns (Beede et al., 2011). It is worth noting that the pay differences listed above are now out of date and general observations from the Department of Labor indicate that the pay gap has continued to widen in this area (Wang & Degol, 2017).

Motivations for Career Choice

Personal Interest has been identified as one of the major factors of motivation for career choice (Schultz et al., 2017; Tracey et al., 2005). Tracey et al. (2005) found no relation between academic skills and subsequent interests, and asserted that academic skills and abilities are independent within and across time. Guidance counselors spend a great deal of time focusing on matching individual students' interest with their environments to help them attain their career goals. Although this question has different implications for high school age students, a recent study found that additional monitoring needs to occur beyond the typical age that interest is assessed and that interests are likely to change over time, even into an individual's working years as they begin to have job experiences (Schultz et al., 2017). A recent nine-year longitudinal study tracked middle school students for six years and identified themes of ability and interest fit as playing the largest role in determining a student's choice and success in pursuing a STEM career (Le & Robbins, 2016). This study found that ability is usually more stable than interest fit, which is contradictory to an earlier study that determined that interest was more stable than ability (Tracey et al., 2005).

The literature on women student motivation for choosing a career presents several differing theories on the reasoning behind a student's choice. There is significant evidence to support that women students are drawn to careers that highlight communal goals or helping others (Brown et al., 2016; Diekman et al., 2010). This theory was explored through the lens of understanding communal motivations and their impact, whether negative or positive on a student's choice. The authors of the study noted that even small effects of communal motivation could lead to women students opting out of STEM careers, especially if negative effects of communal motivation were to accumulate over time.

Barriers to the Recruitment of Women in STEM

There has been a great deal of research focusing on increasing women participation in STEM majors. The research generally finds that there are great differences in terms of recruitment, retention, and persistence among our institutions of higher education. One finding of particular interest analyzed data from the National Longitudinal Survey of Freshmen as well as several other National Education Longitudinal studies. This study concluded that students at institutions with more undergraduate students relative to the number of graduate students are more likely to persist (Griffith, 2010). This particular finding seems to support the idea that institutions with a focus on undergraduate education are more successful in recruiting and retaining their undergraduate students. This study also explored how women are impacted by graduate teaching assistants, generally reporting that they have a positive effect on persistence rates of women in STEM (Griffith, 2010). Early impacts of advising and

freshmen year experience have also been related to the initial recruitment of students in baccalaureate programs (Brown et al., 2016; Diekman et al., 2010).

Wang and Degol argue that the underrepresentation of women in math-intensive STEM fields is a wide ranging cultural phenomenon brought about by the interaction of six underlying factors: (1) absolute ability differences, (2) relative ability strengths, (3) career preferences, (4) lifestyle preferences, (5) field-specific ability beliefs, and (6) gender stereotypes and bias (Wang & Degol, 2017). Policy makers can use these factors to help understand some of the issues around recruiting women students into collegiate level STEM programs. Combating these factors to help prepare students to enter STEM programs can require very early intervention, which might ideally be placed in middle school (Cho et al., 2009; Hoepner, 2010; Leavey, 2016; Wang & Degol, 2017). Unfortunately initiating recruiting programs that interact with middle school aged women students is not entirely under the control of most colleges and universities when planning for outreach programs.

A common criticism of women in STEM initiatives is that they are mostly about marketing and providing access to women students. Some experts argue that simply recasting STEM as being more girl friendly does nothing to alter the culture or the scientific practices of the field (Heybach & Pickup, 2017). This problem has also been restated by expressing the concern that this argument makes it appear that women and girls have little to offer STEM, but that STEM has much to offer them. Heybach and Pickup (2017) refer to this trend as "painting STEM pink." The authors also argue that this problem begins much earlier in life than most of the recruitment and retention methods are capable of dealing with because they ignore the impact of play, and how the

current toy market could perpetuate the issue by producing pink and blue toys that create stereotypes early in children's lives (Heybach & Pickup, 2017).

In another qualitative study, many interview participants also indicated that guidance counselor and school structure can play a role in their major and college choices after high school (Lee, 2008). The participants wondered if there was an evident presence of a "tracking" system that discouraged women students from taking technology-based courses and encouraged them to pursue course work in the arts. This idea could have major implications for shaping students during their high school career and therefore plays into the theories about ability and motivation that have been identified to shape students' major intent (Cho et al., 2009; Maltese & Tai, 2011; Wang & Degol, 2017; Wickersham & Wang, 2016).

The STEM Pipeline

The term "Leaky Pipeline" is often used as a metaphor for the greater likelihood that women leave STEM fields at every point from recruitment to attrition after graduation (Goulden et al., 2011). When viewed as a pipeline, men have a much higher chance to avoid the phenomenon of leaking or leaving the field during their educational journey (Cannady et al., 2014). This idea has been examined dating back to the 1970's at all educational attainment levels, and the rates of attrition have not changed significantly since at the undergraduate level. Miller and Wai (2015) recently conducted a study that concluded that the piece of the pipeline from the bachelor's degree to the Ph.D. is no longer leaking women at a higher rate than men. The authors conclude that there is a great need to understand the gender differences in STEM programs at the bachelor's level and below as that is the section of the pipeline that is leaking the most (Miller & Wai,

2015). This finding exemplifies the need to support women as they explore the field in an educational setting.

Another significant area of research around women in STEM relates back to marketing and changing perceptions. One study described this phenomenon as recasting it as girl friendly and even attributes the color pink to this idea (Heybach & Pickup, 2017). Other studies have deemed the degree programs as a "leaky pipeline" which is not equitable between the sexes (Blickenstaff, 2005). The National Science Foundation has many differing efforts to increase women participation in STEM education. Through their Broadening Participation Programs, they allow many colleges and universities to explore support systems for the recruitment and retention of women and minority students into a STEM related program (James & Singer, 2016).

Facilitators to the Recruitment of Women in STEM

As noted in the Barriers to Recruitment section, the six cultural factors that were identified by Wang and Degol (2017) can lead to great implications for modifying recruitment programs in a way that would better speak to women students. Whenever possible, intervening early to provide STEM experiences to middle school aged students would have implications for developing student interest (Cho et al., 2009; Wang & Degol, 2017). Since women students are more likely to prefer careers that allow them to work with people and positively contribute to society, STEM occupations have to be represented in ways that would appeal to that view. College recruiting programs that could emphasize how advancements in computer science and engineering improve the quality of life for all of society and require a great deal of interpersonal connections and

collaboration to achieve, thus fighting the stereotypes that exist about STEM careers (Lee, 2008).

There is much evidence to suggest that positive role models during high school and access to STEM course options can serve as a facilitator for recruitment. One study found that African American women students were particularly impacted by the number of math and science courses that were not only taken by the student, but were available at their respective high schools (Maltese & Tai, 2011). Another study found that the gender composition of high school math and science faculties has an important relationship to whether or not a women student will pursue a STEM degree once they arrive at college (Bottia et al., 2015). The same study also references findings to support that having more women math and science teachers in high school did not have a measurable impact on male students, but proved crucially important challenges to gender stereotypes by demonstrating a professional women role model (Bottia et al., 2015).

The STEM Pipeline

The impacts of Perkins legislation is also frequently discussed with regards to encouraging access to vocational training for non-traditional groups of students. The original 1984 version of Perkins required that states appoint a sex equity coordinator to direct efforts to reduce not only gender bias but also stereotyping in areas of vocational education. Later versions of the bill significantly reduced the number of required gender equity programs (Toglia, 2013). In recent congressional hearings about the possibility of a renewed Perkins bill there are active discussions about whether gender and racial equity programs should be incorporated into the bill (Improving Career and Technical Education to Help Students Succeed in the Workforce, 2015). The reauthorized fifth version of

Perkins, or Perkins V maintains statements of support for women students in CTE programs. A key piece of the legislation reads "CTE will provide support for students who are members of groups underrepresented in such subject fields, such as women students, minority students, and students who are members of special populations" (Perkins V, 2018, p. 53). This legislation is key in providing educational opportunities for high school students who may be interested in STEM related subjects.

The Role of CTSOs

Career and Technical Student Organizations, or CTSOs, have long been an integral part of Career and Technical Education (CTE) in the United States. The George Barden act of 1946 was the first piece of legislation that specifically mentioned what was then called Vocational Student Organizations, and allocated funding for CTE teachers whose duties included the advising and supervising of these organizations (Threeton & Pellock, 2016). CTSOs have had a great impact on the recruitment of students into CTE programs, many of which are designated as STEM programs. Recruitment is defined as a primary function of many CTSOs that are operated at the secondary level. Recruiting events and open marketing of CTE programs is often occurring in reference to the extracurricular activities that are being hosted by local CTSOs (Reese, 2003, 2010).

In the last half of the 20th century Perkins legislation has changed the face of CTE in many ways, but each iteration of Perkins has renewed the intricate relationship between CTSOs and CTE (Aragon et al., 2013; Reese, 2003, 2010). The U.S. Department of Education recognizes eight CTSOs at the secondary and collegiate levels which includes Business Professionals of America (BPA), Distributive Education Clubs of America (DECA), Future Business Leaders of America (FBLA/PBL), Family and

Community Leaders of America (FCCLA), Future Farmers of America (FFA), Health Occupations Students of America (HOSA), SkillsUSA (Formerly Vocational Industrial Clubs of America), And Technology Students of America (TSA) (Reese, 2003; Threeton & Pellock, 2016). Of the organizations listed, STEM programs are most often associated with SkillsUSA, Technology Students of America, and Future Business Leaders of America, however all the clubs contain some level of STEM related activities, recruitment, or professional development for students (Threeton & Pellock, 2016).

Barriers to the Retention/Persistence of Women in STEM

Dropout rates are significantly higher among women students in STEM majors compared to the majority of other majors, and many students who leave STEM majors decide to do so in the first two years of college (Herrmann et al., 2016). Although the research tends to investigate many differing possibilities for low enrollment in STEM programs relating to women students, it is obvious that initial enrollment is not the only problem for women students. Typically, around 40% of men who complete a STEM related degree work in STEM jobs, however that number drops down to 26% of women (Beede et al., 2011). Explanations for this statistic could be attributed to higher numbers of women who prefer to utilize their degree in education or healthcare as compared with their male counterparts (Hand et al., 2017).

The Role of Faculty and Staff

A recent study compared the effectiveness of a blended instructional model and a flipped instructional model relating to a numerical methods course at several engineering schools. The blended model was described as consisting of mostly lecture with some in class active learning, and technology was also utilized for both in and out of classroom

activities (Clark et al., 2018; Wilson-Kennedy et al., 2019). This study seemingly supports the idea that the teaching of STEM courses in a traditional format is largely ineffective and that students display higher levels of engagement and enhanced learning with the filliped model versus the traditional or blended model (Clark et al., 2018).

Although syllabi are perhaps not often considered through the lens of retention, a study titled, "A Critical Discourse Analysis of Engineering Course Syllabi" found that low recruitment and retention among women in STEM fields may be partly associated with disengaged syllabi in introductory STEM courses (Savaria & Monteiro, 2017). The article speaks to the importance of mapping class assignments and readings to real world applications in multiple disciplines. Increasing the awareness about how topics learned in a particular course will impact society is identified as an important connection that is particularly valued among women and other minorities in STEM related coursework (Savaria & Monteiro, 2017). The authors seemingly suggest a technology solution to create inclusive syllabi that properly utilize student learning outcomes to map assignments to specific pieces of knowledge or skills that relate to multiple disciplines.

Some studies attribute other more subtle forms of bias to retention issues for women students in STEM programs. One study examined instructors and students in STEM programs by asking them to attribute masculine and feminine traits to the typical scientist or humanities professional. Both groups seemingly suggested an underlying belief that men (students) tended to perform better than women (students) in STEM disciplines which has broad implications for recruitment and retention in STEM (Hand et al., 2017). The test groups in this study also tended to attribute feminine qualities to the humanities and masculine qualities to the sciences. The results of this study could imply

an incoming bias on the part of many instructors about the performance of prospective or current women students.

Colleges have been slow to transition STEM programs to online platforms because of beliefs that much of the content needs to be absorbed in a lab environment, or that it requires hands-on skills that are not easy to teach virtually (Clark et al., 2018). There is a great deal of potential to expand access to STEM degrees by utilizing technology both for classroom materials as well as lab environments. A flipped or blended instructional model could even be utilized for the more hands-on skill degrees by creating flexible lab times for students to visit campus in order to complete labs. There are still some STEM related subjects in the industrial technologies which would not work well in an online environment, but the classroom materials could be virtualized. Computer Science seems to be one of the areas that would be easiest to implement technology enhanced learning strategies considering that many of the required labs are already conducted in an easily deliverable virtualized format (Lehman et al., 2017).

The Role of CTSOs

CTSOs are often characterized as a facilitator to retention, however they often face challenges around funding and support. Federal support for these organizations has evolved greatly over time. Perkins IV greatly increased the accountability and reporting standards that are now present in career and technical education. The Perkins IV legislation began using new terminology in two ways that have shaped the scholarship and practice of vocational education. Not only did the legislation change the terminology from vocational education to career and technical education, it also reinforced the idea of college and career readiness (Castellano et al., 2011). College and career readiness is

defined in several different ways by different states, however Perkins IV forced the integration of career and technical education with academic coursework to ensure that students were ready for either college or a career and to ensure that students were presented with education on the options for both college and career selection (Lakes, 2007). Many states began to modify their CTSO programs to ensure that the college and career readiness aspects of these organizations were used to meet the guidelines outlined within Perkins IV (Stanislawski & Haltinner, 2008).

A significant responsibility has been placed on CTSOs to meet defined Career and Technical Education program outcomes. Many times, those responsibilities can span leadership development, competitive events, professional development, and community service as the essential elements of running and advising a CTSO chapter (Stanislawski & Haltinner, 2008). Effectively integrating a CTSO into a CTE program requires CTE teachers to take on roles that are often viewed as beyond those of a teacher (Reese, 2003; Stanislawski & Haltinner, 2008; Threeton, 2006; Threeton & Pellock, 2016). Advisers of student run organizations require skills that link teaching to mentoring, guiding, leading, managing, and motivating students in settings and environments that are many times outside of the traditional school setting (Stanislawski & Haltinner, 2008). Institutions must be able to support and aid instructional staff who sponsor CTSO's because of this increased workload that club sponsorship suggests.

Facilitators to the Retention/Persistence of Women in STEM

Addressing some of the obstacles encountered by women pursuing STEM majors entails reaching out to them at their initial educational stages, with a significant proportion commencing their higher education journey at community colleges (Mooney

& Foley, 2011). Owing to their affordability and widespread accessibility, nearly half of those who ultimately attain a 4-year STEM degree embark on their academic path at a community college (DeAro et al., 2019; National Science Foundation, n.d.). Prioritizing attention on community colleges is also logical due to these institutions experiencing the highest rates of STEM student attrition. While the attrition rate for STEM students at four-year institutions stands at 57% between freshman and senior years, it rises to 86% between the first and second years at community colleges (Labov, 2012).

Building off the vast body of existing undergraduate retention research, Tinto worked on the first version of his Institutional Departure Model in 1975 (Tinto, 1975). This model has been widely embraced as a way to examine undergraduate student retention and has been revised several times since its initial conception. The primary argument in Tinto's model is that students' experiences, especially in their first year of college are marked by a series of stages, and persistence or departure is inherently dependent on the successful navigation of those steps (Othman Aljohani, 2016). Tinto's model of institutional departure takes many aspects of the institutional experience into account such as academic performance, faculty staff interactions, extra-curricular activities, and peer group interactions (Brunsden et al., 2000; Tinto, 1975, 1990, 1993, 2006, 2017).

One study indicated that the development of a strong science identity plays a crucial role in the success of the student, and that the development of that identity can be impacted by extracurricular activities such as student clubs and organizations (Maltese & Tai, 2011). Another aspect of student clubs and organizations that may play a role in retention is their ability to form traditions and rituals that provide a deeper connection

between institutions and students. The creation of rituals can provide a connection to something "almost mystical" or something that is hard for words to capture (Bolman & Deal, 2013). Maltby et al. (2016) found that students who participated in support groups and clubs experienced a greater sense of belonging and were most likely to continue their education until its completion if they were involved in student clubs or living learning communities.

Another research study examines the long-term benefits for women students who participated in a living learning community were significantly more likely to receive an undergraduate degree, and nearly three times as likely to pursue a master's degree (Maltby et al., 2016). Of the many positive experiences that are often associated with a living learning community, perhaps the most compelling are the reported significance of a strong community of peers and women role-models and the role they play in student success (Wickersham & Wang, 2016)

The Role of Faculty and Staff

The development of science identity can provide another lens for examining student retention and persistence. Perhaps one of the strongest models of science identity was developed by Carlone and Johsnon(2007) who examined the persistence of women of color in science related degree programs. The study found three factors that can be used to predict persistence in science related fields: competence, performance, and recognition (Carlone & Johnson, 2007). These factors are often hard to manipulate considering the early interventions that are required to address competence and performance on math and science which are often acquired in middle school coursework.

A study conducted out of the University of Michigan examined the impact of a Living Learning Community (LLC) on students enrolled in STEM degree programs. The LLC was titled Women in Science Residence Program. One of the unique aspects of this LLC was that it also included a one credit hour course titled STEM Challenges/STEM Successes which was part of a support system from faculty (Maltby et al., 2016). The study concluded that when taken together, the co-curricular pieces of the LLC worked to build a supportive environment that contributes to students' sense of belonging and formation of science identity.

Researchers at The Open University in the United Kingdom have studied methods for combining feminist pedagogy and transactional distance to create gender-sensitive technology enhanced learning experiences. The researchers examine several facets of distance education that have traditionally been successful with women students and examine how that success could be enhanced. Herman and Kirkup (2017) authored an article titled, "Combining feminist pedagogy and transactional distance to create gender-sensitive technology-enhanced learning". This article asserts that it is widely acknowledged that women were some of the earliest to benefit from distance education because they may have been excluded formally, or by their responsibilities at home, from traditional classroom education. The authors argue that distance education utilizing a learning management system can provide for the personalization that women students often desire as well as work to diffuse some of the gender and power dynamics that might exist in a classroom that is dominated by men (Herman & Kirkup, 2017).

Many technology enhanced learning strategies could be suggested to increase the recruitment and retention of women students. Fain (2018) described a new master's

degree program from the University of Pennsylvania in Computer and Information Technology. The new initiative attempts to utilize technology from the Coursera platform to increase access to students from all backgrounds (Fain, 2018). It is advertised as a degree program designed for students who either cannot or will not enroll in the established on-campus program in the same subject. This degree program builds on the success from the Georgia Institute of Technology which created a Computer Science degree through Udacity in 2013. The Georgia Institute of Technology degree touted a total tuition cost of only $7,000 and grew to over 6,365 students making it the largest computer science program in the country (Fain, 2018).

The Role of CTSOs

CTSOs have developed many important activities that add value to the classroom instruction of CTE programs, while also developing leadership, community service, and employability skills. Reese (2010) noted, "In career and technical student organization chapters across the country, young people are learning more than just skills for future careers, they are also being guided by the career tech educators who are their advisers, and they are also learning to become good citizens who will contribute greatly to their communities and to their nation" (p. 1). Generally, these organizations operate on a local, state, and national level, with career and technical education instructors serving as chapter advisers for the student members (Reese, 2003, 2010). Local chapters elect officers, conduct community service, compete in state and national events, and provide extracurricular activities for their respective subject areas. It is estimated that there are over two million student members that participate in CTSOs each year in the United States (CTSOS.ORG, 2019) Another study found that there are benefits to both

psychosocial and achievement outcomes for women students who participate in a STEM related CTSO, and that those benefits are not only greater than those experienced by male students, but they also directly impact retention for students in the organization (Aragon et al., 2013).

After Perkins IV there is still great variation in how career and technical education is approached across state lines, especially concerning how funding and resources are allocated to CTSOs. A 2008 study found that Louisiana, Mississippi, North Carolina, and Ohio represent the states with the most developed system of career and technical education. The study also discusses the benefits of standardizing the practices among states to minimize barriers for students moving out of state and for aligning course work to professional certifications or career credentials (Castellano et al., 2011). Perkins IV helped to standardize some of this by increasing the emphasis on the labor market, however there is opportunity to incentivize the use of promising practices by providing special grants for states to explore such avenues or for individual CTSO chapters to tailor internship and job shadowing experiences for the labor markets that they serve locally.

In 2012 several federal departments began to work much closer together around the ideas of career and college readiness, career and technical education, as well as career pathways. The Department of Labor, Education, and Health and Human Services issued a policy letter that reiterated their support for secondary-to-postsecondary education with the inclusion of work-based learning such as apprenticeships. With the support from several federal departments, new legislation was passed in 2014 titled the Workforce Innovation and Opportunity Act, or WIOA (Castellano et al., 2017). WIOA provided further funding for the design and assessment of new programs that are intended to train

both traditional and non-traditional students for jobs that are currently in high demand. Many colleges adjusted Co-operative education and internship programs that have traditionally been a piece of CTSOs to better align with WIOA standards and regulations (Castellano et al., 2017).

CTSO's, by design, function in several different spaces encompassing both classroom and extracurricular experiences for career and technical education students. Regina Deil-Amen's concept of Socio-Academic Integrative Moments (SAIMs) refers to instances where social and academic experiences intersect, fostering an environment conducive to student engagement, learning, and overall success (2011). These moments are significant in higher education because they promote a holistic approach to student development, recognizing that social interactions can deeply influence academic performance and vice versa. Deil-Amen emphasizes that creating spaces where academic and social spheres overlap can help students feel more integrated and connected to their educational institutions, thereby enhancing their motivation and commitment to their studies (Deil-Amen, 2011).

Student clubs and organizations like CTSOs have a unique potential to foster SAIMs. By providing a platform where students can engage in activities related to their academic interests in a social setting, these clubs create opportunities for meaningful interactions that blend educational pursuits with personal connections. For instance, CTSOs such as SkillsUSA often organize study groups, academic workshops, and social events that allow members to discuss course material, share knowledge, and build friendships simultaneously. Such integrative moments can help students feel more supported academically while also developing a sense of belonging and community

within the institution. This dual reinforcement of social and academic support structures is crucial in helping students navigate the challenges of higher education and persist toward their educational goals (Deil-Amen, 2011).

The Role of STEM Related Student Organizations in Retention and Persistence

Several studies have demonstrated that students who participate in a CTSO such as SkillsUSA have an increased career self-efficacy and career awareness as a result of participation (Aragon et al., 2013a; Reese, 2003; Threeton & Pellock, 2016). Maldonado and Jaeger (2021) conducted a qualitative study to examine the connection between SkillsUSA and the student's preparedness for the workforce, in which participants reported that SkillsUSA events helped them prepare for the workforce by increasing soft skills and confidence. This study was not specifically examining women in STEM and focused on the career implications of SkillsUSA participation for all students. Interestingly, the study identified Social Support as one of the primary themes that emerged through interviews with participants, indicating that participants viewed participation in the organization as a net positive in developing relationships with peers and with instructors. An additional qualitative study could be used to explore descriptions of the impact of these social support findings, or to investigate whether they have persistence or retention implications for students.

A quantitative study examined the benefits of CTSOs on female and racial minorities psychosocial and achievement outcomes (Aragon et al., 2013a). The authors concluded that participation in a CTSO resulted a statistically significant higher mean academic score in the related coursework and added that girls who participate in a CTSO typically benefit more from the experience than boys (Aragon et al., 2013a). This

conclusion was reached by comparing the academic performance of both boys and girls who participate in a CTSO versus the academic performance of students who did not participate in a CTSO. The study recommended future research around the non-academic impacts of CTSO participation and outlined that the limitation of their study was tied to grade performance only. These limitations could be explored using a more inductive qualitative design to produce descriptions of the experiences of SkillsUSA members.

The studies reviewed in this section use different methods and theories to examine the impact of CTSOs on different populations of students. This dissertation situates findings around the bounded case of the Southwest District of SkillsUSA in North Carolina and focuses on the impact for women in STEM. This particular gap in the literature has been pointed out by authors referenced above and represent an area of opportunity for future research.

Summary

The literature reviewed in this chapter demonstrates the background and current knowledge surrounding the recruitment and retention of women in STEM, as well as an overview of the many factors typically associated with the persistence of women in STEM programs. As demonstrated through the literature review, the existing research on student clubs and organizations for women in STEM is mostly centered around the experiences of 4-year students or contains a living learning community, which is simply not possible at most community colleges (Hoffman et al., 2010; Leavey, 2016; Maltby et al., 2016).

Although the underrepresentation of women in STEM jobs and majors can be traced to a great many factors, there are several potential strategies for increasing women

participation in this growing area of employment. As educators it is important to consider the life outcomes such as wages, job security, low unemployment rates, and job growth in this sector when advising and working with students. The hope of preparing all students for future careers cannot exclude our women students. Breaking down some of the barriers women in STEM majors face involved meeting them where they are, and many women students get their start at their local community college. Examining the experiences of students in question has the potential to provide insight into retention from the perspective of the student. It is imperative that perceptions about women in STEM are changed and that this issue is examined in greater detail.

As students are increasingly utilizing community colleges to obtain STEM related credentials, it becomes increasingly important that best practices are explored to promote persistence of women in STEM at the associate degree level (Hagedorn & Purnamasari, 2012; Mooney & Foley, 2011; White House, 2011). This explored the influence of an on-campus STEM related student organization (SkillsUSA) on women in STEM and captured the perceptions of women who participate in the organization. The current research centers around residential 4-year experiences, and CTSO's such as SkillsUSA are typically not explored by existing studies.

CHAPTER 3: METHODOLOGY

Chapter one introduced the study, its purpose and basic design principles, while chapter two provided a background of the current scholarly research and literature. This chapter will outline the methodological underpinnings of this study, and how they were used to explore the research questions. The chapter describes the study's research design, context, data collection, and data analysis. These sections are followed by a description of ethical considerations and methods for data quality.

Research Design

The study strives to explore the influence of an on-campus STEM related student organization on the persistence of women in STEM related Associate in Applied Science degree programs at public two-year community colleges in central North Carolina. Specifically, it explored the perceptions of students who have participated in a student organization, SkillsUSA. A qualitative case study approach was used to complete this study. This approach was chosen to capture in-depth descriptions of participation in the student organization from the point of view of the student. The bounded case under study was the Southwest Region of SkillsUSA in Central North Carolina. Qualitative research provides the researcher with opportunities to explore "how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" (Merriam & Tisdell, 2015, p. 5). As such, a qualitative case study approach allows the researcher to strive for a rich and holistic description of the phenomena under investigation and provides space to explore both opportunities and challenges associated with extracurricular support organizations at the community college level.

Research Questions

The purpose of this qualitative case study was to explore the influence of on-campus STEM-related student organizations on the retention of women in STEM programs and to capture the perceptions of women who participated in a student organization intended to support the persistence, retention, and success of women pursuing a STEM-related degree at the community college level. The following research questions guided this study:

1. What aspects of participation in SkillsUSA are the most impactful for women in STEM?
2. How do women in STEM perceive the role of SkillsUSA in their persistence in STEM programs?
3. What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM programs?

Role of the Researcher and Positionality

My role as the researcher was that of a typical qualitative researcher, meaning that I was directly responsible for every aspect of this study. I designed the interview guide, focus group, and observation protocol, performed the data collection and analyzed all of the data. To that end, it is important to address researcher positionality and subjectivity in this study. It is important to fully disclose my current job and discuss this study's impact on my career. At the time this study was conducted, I served as the Dean of Technical Programs at Rowan-Cabarrus Community College (RCCC) in Salisbury, North Carolina. As part of this role, I supervised 11 full-time faculty members and about 35 part-time faculty members as they taught courses relating to Information Technology, Engineering, Automotive Systems, Construction Technologies, Mechatronics, and

Electronics Engineering. The Carl D. Perkins Act considers women in STEM-related Career and Technical Education programs to be "non-traditional" and encourages educators to work to increase non-traditional student enrollment (Threeton, 2006). All community colleges in North Carolina receive Perkins Act funding and may choose to address many of the enrollment-related items that are provided for within the legislation. As an administrator in career and technical education, I directly benefit from increased recruitment, persistence, and retention within my STEM-related associate degree programs.

As part of my role at RCCC, I serve as a principal investigator for a National Science Foundation Advanced Technological Education grant (NSF ATE) titled Increasing Women in Engineering and Industrial Technologies, or WE-IT (NSF DUE 1801136). This grant provides my institution with funding to pursue various recruitment and retention strategies that may impact women in STEM programs. For this study, I chose to include students in the associate in engineering transfer degree as well as any other STEM-related associate in applied science degree that I did not directly supervise. Choosing a degree that I do not directly supervise minimized issues of power when talking with students and faculty advisors about their experiences related to this topic. It should be noted that I serve as an instructor for 1 course each semester, and my title of Dean of Technical Programs could create issues of power for students currently enrolled at my institution. My awareness of these potential biases enabled me to contain my subjectivity during data collection and analysis.

Research Site and Participants

Research Site

SkillsUSA is a Career and Technical Student Organization (CTSO) whose mission is to "empower its members to become world-class workers" (*SkillsUSA.Org*, n.d.). As a CTSO, SkillsUSA operates at the national, state, and local levels, which eventually culminates into chapters that are present at participating institutions (Maldonado & Jaeger, 2021; *SkillsUSA.Org*, n.d.; Threeton & Pellock, 2016). SkillsUSA has a national-level administration consisting of a professional administrative department and elected officers from all over the US. Each state operates a state-level SkillsUSA organization that coordinates the major statewide initiatives, and each state sponsors organized chapters within each community college that chooses to participate. SkillsUSA also includes a secondary-level organization typically present at most high schools in the state, which was not included for the purposes of this study. The individual chapters have a faculty advisor, and student elected officers to organize the efforts of the chapter (*SkillsUSA.Org*, n.d.).

The bounded case under study, the Southwest Region of SkillsUSA, requires that the organization itself represent the research site. SkillsUSA has chapters at many institutions in North Carolina. However, participants for this study were in the Charlotte area to facilitate interviews through personal contacts. SkillsUSA defines this service area as the Southwest North Carolina Region. I maintain an active membership with SkillsUSA and, as such, was able to use personal referrals from other SkillsUSA advisors to conduct interviews. As of 2024, there are 7 Community Colleges that participate in the Southwest North Carolina Region.

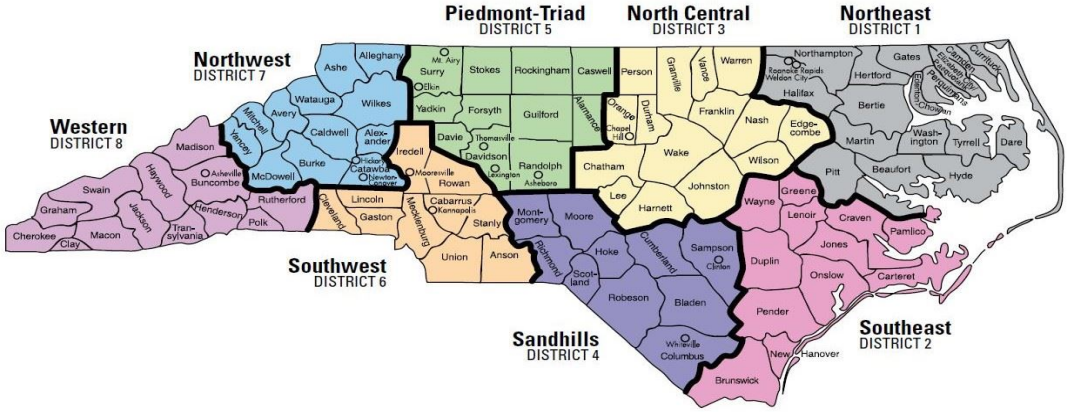

Figure 1 *SkillsUSA North Carolina Regions* (*North Carolina School Counselor Association - Regions*, n.d.)

SkillsUSA Events

SkillsUSA chapters hold monthly meetings at their home institution, participate in regional competitions and business meetings, and represent their members at state-level conferences (*SkillsUSA Championships (Career Competition Events) - SkillsUSA.Org*, n.d.). SkillsUSA organizes professional conferences at the national and state levels each summer and fall. These conferences allow all SkillsUSA members nationwide to gather and compete in many fields. The competitions are designed to help students develop skills, both in their desired discipline as well as soft skills. I attended the summer and fall 2023 SkillsUSA conferences to achieve a higher level of immersion into the phenomena of participation in the organization.

Participant Selection

The participants in this study were selected using a purposeful sampling method through contacts within the SkillsUSA organization, as well as referrals from STEM and industrial technology instructors through the North Carolina Community College System listserv, of which I am a member of both. A unique purposeful sampling technique best

fit this study because the participants needed to possess rare, atypical, or unique attributes relating to the phenomena under study (Creswell, 2013; Merriam & Tisdell, 2015). The participants of this study met the following selection criteria:

1. Individuals who identify as women who are at least 18 years old and in the second year of study in their degree program.
2. Enrolled in an engineering or industrial technology-focused AAS or AE degree.
3. An active participant in a chapter of the SkillsUSA student organization for at least one full 16-week semester.

Creswell (2013) suggested that case study research should include around five total participants. This number is suggested as a way to allow for a deeper investigation and analysis of the themes present in the case. This study included seven participants to help ensure saturation, and because only two students were able to participate in a focus group discussion. In the fall semester of 2023, there were 12 total eligible participants in the Southwest Region, with five who were unable to participate. Second year students were chosen so they are better able to speak to the experiences provided by the organization and to ensure that they have been enrolled long enough to develop relationships with the students and faculty involved in the organization.

Participant Recruitment

Access to the participants was negotiated with the SkillsUSA regional coordinator, following the organization's policy on institutional research. An invitation email introducing myself and my study, along with the Informed Consent Form (Appendix A), was sent to every eligible SkillsUSA member in the Southwest region of

the organization through data that was provided by the SkillsUSA administrators in the region. All communications and data were retained within a University of North Carolina Google account, which is secured with two-factor authentication. This study used unique, purposeful sampling to ensure that the participants were best situated to provide data on the selected research questions. A unique sample is based on unique, atypical, or rare attributes related to the phenomenon of interest (Merriam, 2009). The participants met all the criteria outlined in the participant selection section above.

SkillsUSA North Carolina participates in research projects and requires that its members voluntarily elect to participate in any such research project. The invitation email was created and sent to SkillsUSA NC leadership which was then forwarded to their members. Each student who accepted the invitation to participate was contacted and interviewed. It is important to note that contact information for the students solicited in this study was provided by contacts within SkillsUSA, which is a career and technical student organization often popular with students who are majoring in a STEM-related field and serves students at the secondary and post-secondary levels. Interview participants were recruited after participation in a state-level conference. The interviews featured open-ended questions at the end prompting the participants to reflect on topics relating to the research questions after they have participated in a SkillsUSA-related state-level event.

Data Collection

For effectively presenting detailed case descriptions and identifying thematic patterns within cases, the incorporation of various sources of information is deemed crucial in this research (Creswell, 2013). Data collection spanned a six-month period

from June to December 2023, involving semistructured interviews, observations, document analyses, and a focus group.

Semistructured Interviews

This study includes interviews of students who fit the criteria defined in participant selection. The interviews were recorded, and notes were also taken. The initial questions were broad in nature, and the interview included an open-ended follow-up question. Interviews were allowed to progress naturally, and if more clarification about a particular answer was needed, further probing questions were developed as the interview progressed to determine best what the interviewee was thinking/saying about their STEM experiences with the student organization. This study utilized an interview protocol (Appendix B) as a way to guide the conversation, and probing questions were introduced as necessary throughout the interview process. Focus was placed on questions that can provide holistic descriptions of the bounded case under study.

Document Review

Documents in qualitative research are often described as any public records, personal papers, visual documents, agendas, or artifacts relating to the phenomenon under study (Merriam, 2009). Document reviews played a crucial role in this qualitative study by providing contextual background and supplementary information to complement the primary data collected through interviews, observations, and a focus group. This study features insights that were gleaned from the SkillsUSA Membership Benefits Guide, the suggested Local Chapter Constitution, and the Official SkillsUSA Championship Policy book, all of which are available publicly on the SkillsUSA website and are often handed

out at events (*SkillsUSA.Org*, n.d.). Document reviews can serve as a means of triangulation (Ravitch, Sharon M.; Carl, 2016).

In this study, document reviews helped to construct the original interview guides but primarily helped to corroborate findings from interviews and the focus group, thereby enhancing the validity and reliability of the findings outlined in chapter four of this study. The SkillsUSA Membership Benefits Guide outlined much of the intended purpose of the various SkillsUSA events and helped to guide the structure of the observations. These documents worked to outline how the SkillsUSA organization views its various support efforts for women in STEM, as well as providing information about how competitive events would be scheduled and layered with other professional development offerings available to participants.

Focus Group

As this study delves into the involvement experience within a group-oriented student organization (SkillsUSA), the inclination is towards gathering comprehensive insights from a collective of participants concurrently. Utilizing focus groups offers distinct advantages over individual interviews, facilitating initial exploratory discussions and fostering diverse viewpoints without the necessity for unanimity (Creswell, 2013; Merriam & Tisdell, 2015). Creswell (2013) recommends employing focus groups when participant interaction promotes a smoother exchange of information, especially when individuals share similarities, exhibit cooperation, time constraints for data collection exist, or when respondents may exhibit reticence during one-on-one interviews (2013, p. 133). Given the homogeneous nature of the interviewees, their accustomedness to group

dynamics, and the likelihood of cooperative engagement, employing focus groups aligns well with the objectives of this research.

Krueger and Casey (2000) noted that focus groups generally evoke less apprehension among participants, suggesting that they may encourage the exploration of topics that could remain latent in individual interviews. Moreover, focus groups resonate particularly well with women in STEM fields, who often gravitate towards projects where they perceive opportunities for contribution and impact (Blickenstaff, 2005; Cho et al., 2009; Leavey, 2016; Lyon, 2013; McGee & Bentley, 2017; Mullet et al., 2017; Sarseke, 2018). Consequently, the focus group may have helped to derive a sense of empowerment or fulfillment from engaging in the focus group discussions with peers. Appendix C features the discussion guide that was used to help structure the focus group used in this study.

Two of the seven original interviewees agreed to participate in the focus group referenced in the findings of this study. The focus group was held in person at the Cabarrus Business and Technology Center in Concord, NC. Both of the participants had recently returned from the national level competitive events were held in Atlanta. The participants in question are assigned the pseudonyms Ada and Eva, and the discussion took place in a one hour and ten minute block of time utilizing the focus group discussion guide located in Appendix D.

Observations

Observations played a significant role in this study by allowing firsthand insights into the dynamic interactions and behaviors within SkillsUSA. Observations often allow researchers to capture non-verbal cues, group dynamics, and contextual nuances that may

not be apparent through interviews or document reviews alone (Creswell, 2013; Ezzy, n.d.; Lapan et al., 2012; Merriam & Tisdell, 2015; Ravitch, Sharon M.; Carl, 2016). I was able to gain a deeper understanding of the lived experiences of the participants by attending the state and national SkillsUSA championships during the second half of 2023, which also helped to shape the coding process by providing an understanding of the role of competition and peer interactions at these events. To facilitate useful data gathering during these observations, I utilized an observation guide (Appendix D), which helped to organize field notes around the events. The observations occurred during the two-day state competition at the Koury Convention Center in Greensboro, NC. This event allowed for observations on state level competitions featuring the participants of this study.

Observations also occurred at the SkillsUSA National Leadership and Skills Conference in June of 2023 in Atlanta Georgia. This event allowed observations of the competitive events occurring throughout the Georgia World Congress Center, as well as the student skills exhibition that took place in the basement of the Georgia World Congress. This provided opportunities to see demonstrations of student work and observer interactions between students and their advisors.

Data Analysis

As with most forms of qualitative research, data analysis took place alongside data collection and began with the first interview (Creswell, 2013; Merriam & Tisdell, 2015; Ravitch, Sharon M.; Carl, 2016). The interviews in this study were fully transcribed by an automatic transcription service and then edited by the researcher while listening to the recording in order to provide additional richness of data and as an attempt

to ensure the trustworthiness of the data (Creswell, 2013; Merriam, 2009). The data was analyzed using NVivo qualitative coding software, and an ongoing research journal was kept consistently updated to reflect new codes and insights.

The transcribed data from the interviews in this study were analyzed to identify common themes, experiences, or events that positively contributed to the student's success in their programs, as well as traits that led to retention into their second year. As common themes and general answers to the questions were determined, they were used to codify the data. Coding is commonly defined as the process of interacting with the transcribed data in order to find themes and information that inform meaningful relationships or other details relevant to the research questions (Creswell, 2013; Ezzy, n.d.; Merriam & Tisdell, 2015; Ravitch, Sharon M.; Carl, 2016).

The data underwent analysis using methods consistent with a generic qualitative approach (Merriam & Tisdell, 2015). Each transcript was meticulously reviewed at least three times, leading to a three-stage analysis process for every interview and reflection. During the initial reading, the researcher worked to actively seek out any elements that appeared noteworthy, significant, or recurrent, utilizing insights from Creswell (2013) and Thomas (2006). This phase involved comprehensive engagement with recordings, transcript perusals, and reflective notes to pinpoint specific salient words or phrases. Drawing from the initial transcript readings and reflections, recurring patterns in the form of categories, factors, themes, or emerging themes were noted and used to inform the coding process (Merriam, 2009). At this juncture, emerging themes were designated with descriptive labels or codes, marking the inception of open coding, a process of disassembling raw data into discrete segments (Brinkmann & Kvale, 2015). These codes

subsequently underwent refinement, grouping, and the addition of new codes as necessary to better align with the data.

During the subsequent examination of transcripts and reflective notes, the data was scrutinized in light of the emerging themes, identifying passages that align with previously designated themes. The primary objective during this phase was to revisit transcripts and reflections to identify passages relevant to each emerging theme. Any new concepts or emerging themes were given new labels or codes as appropriate. Likewise, if certain emerging themes appeared less significant or redundant during this phase, they were eliminated. Consequently, this stage of analysis culminated in the identification and validation of a final set of emerging themes.

Upon completion of the second phase of data analysis and the identification of the final set of emerging themes, the transcripts and reflective notes underwent a third round of scrutiny. In this stage, the objective was to select quotations from participants that exemplify each theme and bolster all analyses and interpretations. This approach amplifies the voices of study participants, enriches descriptions, and serves as an additional means of ensuring the credibility and authenticity of the study (Lapan et al., 2012).

Ethical Considerations

This study underwent review by the University of North Carolina at Charlotte Institutional Review Board, encompassing various aspects of informed consent: elucidation of the research's objectives, assurance of voluntary participation with no repercussions for opting out, delineation of foreseeable risks and potential benefits, articulation of confidentiality protocols, and provision of contact details for inquiries

regarding the research and participant rights. Additionally, the UNCC IRB protocol mandated a thorough outline of procedures and disclosure of any conflicts of interest.

Various ethical considerations may arise depending on the source and nature of qualitative work. The Belmont Report (1979) delineated ethics into three primary principles. The first principle, respect for persons, underscores the voluntary nature of research participation. The second, beneficence, entails evaluating and mitigating risks to participants. The third principle, justice, pertains to participant selection and equitable distribution of benefits (Department of Health, Education, 1979). The ethical considerations outlined in both the Belmont Report (1979) and the UNCC IRB were carefully considered throughout the course of this study.

Qualitative research may present ethical challenges distinct from those encountered in quantitative research. Although qualitative research typically begins with a structured framework such as an interview guide, the lines of inquiry remain flexible and subject to change based on collected data and probing questions posed during interviews. As a result, ensuring a specific protocol becomes challenging (Bogdon, Robert; Biklen, 2007). Given that this study gathered insights from identifiable individuals, guaranteeing participant anonymity is difficult; however, maintaining participant confidentiality remains feasible (Merriam, 2009).

As per Creswell (2013), it is incumbent upon the researcher to proactively anticipate potential ethical dilemmas arising from the research process. This study is committed to safeguarding participants by ensuring the integrity of data collection, analysis, and storage procedures, with utmost respect for participants' rights and values (Creswell, 2013). Given the potentially sensitive nature of qualitative research,

particularly in eliciting responses during interviews, measures were taken to protect participants' statements and opinions by anonymizing references to names and contextual details that could identify them with specific institutions or organizations. Furthermore, voluntary participation and informed consent protocols were rigorously adhered to when engaging with participants in this study.

Strategies for Data Quality

Ensuring the quality of any qualitative study relies heavily on interpreting the data and meticulously documenting the rationale behind specific interpretations (Creswell, 2013; Ezzy, n.d.; Merriam & Tisdell, 2015). Prior to data collection, I engaged in a thorough review of the interview questions and protocols with a colleague. Interviews were conducted with as many eligible participants as possible (seven) to attain data saturation as per the study's selection criteria. As previously mentioned, the coding process was iterative, with codes and themes periodically reviewed with my colleague to maintain consistency.

Enhancements to validity in this study encompassed several measures. Firstly, I provided comprehensive explanations of the data collection methods and outlined the criteria for participant selection (Merriam & Tisdell, 2015). Regarding data analysis and interpretation, I employed diverse data types and utilized triangulation to ensure the validity of my conclusions (Creswell, 2013; Merriam, 2009; Mertens, 2015). Reliability was bolstered through the following strategies:

1. I personally transcribed all interview data and cross-checked the text against the recordings to ensure accuracy. Additionally, I reviewed interview summaries to verify the consistency of the coded data.

2. Code reliability was upheld through iterative processes; transcripts underwent multiple recoding sessions to ensure that the essence of the codes remained unchanged.
3. A codebook documenting each iteration of codes was electronically maintained throughout the analysis, ensuring code consistency. Discussions with colleagues were held to clarify coding logic and enhance reliability, given the single-coder nature of the study.

Dependability, a facet of trustworthiness, signifies the consistency of a study's findings and the likelihood of achieving similar results if the study were replicated in a comparable setting (Lincoln & Guba, 1985). It encompasses the issue of reliability (Creswell, 2013). Following Shenton's recommendations (2004) to ensure the dependability of this research, this study provides a detailed description of the research design and implementation, along with relevant information about documenting data collection and a reflective evaluation of the study. These measures aim to furnish readers with adequate insight into the research context and processes, facilitating potential replication of the study within similar contexts.

Summary

This chapter has furnished an outline of the methodology adopted for this qualitative case study. It encompasses criteria and procedures for participant selection, delineates the researcher's role, and dicusses the data collection methods that were used. Additionally, it delves into the specifics of data gathering via interviews, document reviews, observations, and a focus group, followed by an exploration of ethical considerations, data analysis techniques, and considerations of trustworthiness. The

overarching goal of this research is to gain deeper insights into the impact of on-campus STEM-related student organizations on the retention of women in STEM programs at the community college level.

CHAPTER 4: FINDINGS

The purpose of this qualitative case study is to explore the influence of on-campus STEM related student organizations on the persistence of women in STEM programs, and to capture the perceptions of women who participated in a student organization intended to support the retention and success of women pursuing a STEM related degree at the community college level. A qualitative case study approach was used to complete this study. This approach was chosen to capture in-depth descriptions of participation in a student organization from the point of view of the student. The following research questions guided this study:

1. What aspects of participation in SkillsUSA are the most impactful for women in STEM?
2. How do women in STEM perceive the role of SkillsUSA in their persistence in STEM programs?
3. What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM programs?

This chapter outlines the 6 major themes and 15 sub themes that emerged during the analysis of interviews with 7 students who participated in SkillsUSA, a focus group that was conducted with two of the participants, peer observations conducted at state and national SkillsUSA competitions, and a document review of 3 key SkillsUSA publications. Throughout this chapter, we will seek to provide an in-depth and holistic description of the experiences of the participants. The stories and insights shared by the participants will be brought to the forefront, allowing their voices to be heard as we delve into the rich tapestry of their experiences. Major findings and interpretations are

presented with multiple layers of evidence, such as select narratives from the participants as well as observations and quotations from relevant documents reviewed during the analysis phase of this study.

Description of Participants

Seven participants were interviewed in this study, with two of them participating in a focus group after the original interviews were conducted. These participants were selected following the selection criteria outlines in chapter three to provide insights into their experiences and perceptions of SkillsUSA's impact on their academic persistence and career development. The participants were diverse in terms of their specific STEM disciplines, backgrounds, and levels of involvement in SkillsUSA, allowing for a comprehensive exploration of the organization's influence on their educational and professional journeys. Their voluntary participation in interviews and focus groups enabled an in-depth qualitative analysis of the perceived benefits and challenges they encountered through their engagement with SkillsUSA. Table 1 displays pseudonyms and academic major information for each participant, which can be helpful in reviewing the findings presented within this chapter.

Table 1

Participant Information

Pseudonym	Major	Academic Year
Ada	Construction Technologies	Freshmen
Zoe	Digital Media Technologies	Sophomore
Ivy	Automotive Technology	Freshmen
Lia	Educational Technology	Sophomore
Eva	HVAC Engineering	Freshmen
Mia	Computer Integrated Machining	Sophomore
Ava	Construction Technologies	Sophomore

Alignment of Themes and Subthemes

Table 2 depicts the alignment of the 6 major themes and 15 sub themes amongst the research questions used to guide this study. Explanations of these findings, including supportive evidence and participant quotes are featured in the remainder of this chapter. The 6 themes work to collectively provide insight into the holistic impact of SkillsUSA participation, spanning academic, social, and career domains. They explore how SkillsUSA participation can impact academics, job and career choices, and provide benefits beyond the classroom. Aspects of competition, relationships, and the extra-curricular nature of SkillsUSA are also explored throughout this chapter.

Table 2

Alignment of Themes and Subthemes with Research Questions

Research Questions	Themes	Sub-Themes
Research Question One: What aspects of participation in SkillsUSA are the most impactful for women in STEM?	Benefits Beyond the Classroom	General Benefits
		Institutional Support
	Academic Impacts	Academic Major Decisions
		Retention
		Role of Coursework
		SkillsUSA in the Classroom
Research Question Two: How do women in STEM perceive the role of SkillsUSA in their persistence in STEM Programs?	Competition	State Level Events that led to Connections and Friendships
		National Events
	Job and Career Implications	Impact on Career Goals
		Internships

Table 2 (continued)

Alignment of Themes and Subthemes with Research Questions

Research Questions	Themes	Sub-Themes
Research Question Three: What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM Programs?	The Importance of Relationships	The Role of the Instructor/Advisor
		Peer Relationships
	Extra-Curricular Nature of SkillsUSA	SkillsUSA as a Club
		Chapter and School Pride
		Community Service
		Cost and Financial Implications

Research Question One

This section is dedicated to exploring the intricacies surrounding the research question: *What aspects of participation in SkillsUSA are the most impactful for women in STEM?* This exploration delves into the depths of participant narratives, positioning them within the identified themes and sub themes addressing this research question.

Benefits of SkillsUSA Beyond the Classroom

All study participants spoke to a general theme highlighting their perceived benefit of participation in SkillsUSA. This theme is closely related to several other findings of this study; however, a brief overview of the perceived benefits can be summarized in the following quote from a focus group discussion with Ada and Eva,

> I say it's a good thing to do, because it broadens the persons horizon on their career or their major. It gives them a little more experience and it gives them a deeper understanding of what it’s like to work in their field.

The context of SkillsUSA as a co-curricular student organization, intended to supplement the learning that occur inside of a classroom is illustrated in this perspective. Ada and Eva discussed the benefits of participation in SkillsUSA during the focus group without prompting from the interviewer, and they reiterated that it was a beneficial experience that provided something that was not typically found in a regular classroom.

In the following quote, Zoe reflects upon her experiences with SkillsUSA and speaks to its impact on her self-confidence, particularly in her ability to navigate the professional world independently. Zoe shared,

> It honestly boosted my confidence a little bit more because, before I attended and everything, I was honestly not so sure that I could actually do it in the real world by myself, actually being able to go out and do it. So, this gave me that opportunity to actually see myself in a work position of trying to get it done, so I think that's what really helped me.

Her comments allude to a transformative impact that participation in a SkillsUSA competition had on her ability to visualize herself succeeding in a work environment, dispelling prior doubts about her capabilities.

Eva's reflection offers valuable insights into her perception of the diverse opportunities available within the realm of trades and competitions. Her perspective hints at an expanded horizon of career options, some of which she may not have previously considered. The mention of competitions as resume enhancing experiences underscores the multifaceted benefits she derives from such engagements.

> There's just a lot of things that are considered trades and stuff that I would've never thought about. There're so many competitions there, but I think for me it

> just helps, because it's something else to put on the resume and it helps me get some experience that I wouldn't get otherwise.

Eva's commentary underscores how the experience of participating in SkillsUSA helped create a wider sense of what it means to work in the trades. In this example, SkillsUSA activities such as competitions are featured as a valuable addition to her resume, but also as a way of imparting essential experiential learning.

Institutional Support

In the following quote from Zoe, she expresses an enthusiastic endorsement for an experience she had with SkillsUSA, but she also highlights the level of involvement from other departments at her institution.

> Yes. Now that I've gone, I'm going to be very adamant of talking to people about it, 'cause it was so much fun and it was so nice to be able to get this opportunity to just try things out. I didn't even realize how many different things they give competitions for. Cosmetology was there. I know a lot of things with medical was there. Honestly, the only other two things I was thinking about was masonry and welding. But there's so much more than that. So, I was like, "Yeah, definitely. I'm going to definitely tell people to go because they've got a lot for whatever your career is." I feel like the whole school was there and supportive of each other!

Zoe's post-event reflection underscore her eagerness to advocate for the experience she enjoyed and describes a bit about the overall feeling of seeing large support and turnout from your own institution. Zoe's words hint at the diverse spectrum of competitions and skills she encountered, sparking her desire to advocate for participation in these activities.

Academic Impacts

Participation in SkillsUSA bears a substantial academic impact as illustrated through the experiences and reflections of participants such as Zoe, Eva, and Lia. These individuals, while pursuing diverse fields of study and interests, have all found their involvement in SkillsUSA to be a catalyst for educational growth and development. In the following discourse findings will be presented in order to demonstrate academic impact within the context of related academic skills like time management and the importance of working on a deadline.

The following statement from Lia encapsulates the constructive influence that participation in SkillsUSA related trips has had on her academic and time management skills. These experiences have necessitated meticulous planning and execution of her schoolwork, leading to a positive transformation in how she manages her time and responsibilities. Her testimony speaks to the educational and personal development aspects of her involvement in SkillsUSA related excursions.

> It's definitely impacted me in a positive manner. Going on these trips, you have to get all your schoolwork done ahead of time. So it's definitely helped me to be more managing, and more aware of my time, I guess, and making sure I get my assignments turned in and make good grades, so that I'm able to go places with Skills when we do go on trips.

Lia's narrative highlights the palpable positive impact of her engagement in SkillsUSA related trips. These experiences have cultivated her ability to proactively manage her academic obligations and schedule, fostering heightened awareness of time management. Lia's motivation to ensure her coursework is complete and her tasks are accomplished

reflects the commitment required to participate in SkillsUSA related trips, which, in turn, has contributed to her personal growth.

The following reflection from Ada also illustrates the profound academic and personal growth that often arises from SkillsUSA participation. In the context of her academic journey, Ada found herself confronted with a demanding workload and a pivotal lesson in time management and discipline. Her story is a reminder that the academic path is not always straightforward, and the importance of deadlines and effective time management cannot be overstated. Ada shared,

> this semester, I've had five classes, so I had to push through and learn how to schedule myself and how to evaluate my time. And plus, I got a zero on a paper that I worked hard on that I turned in late and I had to learn the discipline. I had to learn how to be on time for a project for a deadline. So, no matter how much I fussed and complained about it, I worked hard on this paper, it didn't matter. So, it made me appreciate that deadlines are set for a reason, and I need to be on time.

Ada's story serves as a poignant reminder of the transformative power of academic challenges. This narrative illustrates how she navigated a demanding workload, learning the value of scheduling, and perhaps most crucially, appreciated the importance of meeting deadlines.

Academic Major Decisions

SkillsUSA is a co-curricular student organization that has chapters at the middle school, high school, and post-secondary level. Several participants of this study indicated the impact that SkillsUSA had on their academic major choice, at all levels of the organization. Although the interview guide utilized in this study focused on the

experiences of students at the post-secondary level, when asked about choosing an academic major, Ava, Eva, Ivy, and Mia referenced the impact that organization had on their choice of major. This impact occurred at the high school level for Ava, Ivy, and Mia.

Ava's journey to finding her academic major is a testament to the influence of experiences available through participation in SkillsUSA. In this example, it was Ava's involvement during her high school years with a masonry competition which served as the catalyst for her exploration of construction technology as a major.

> And once I got to my senior year of high school, I was kind of trying to figure out what I wanted to do. I just really didn't know what I wanted to do. So, I went and talked to a masonry company at the state competition, and they were like, "Hey, you should go into construction management and technology. That'd be really good for you." So that's how I got into construction technologies, which all kind of came from competing in masonry at SkillsUSA.

Ava's narrative demonstrates the formative power of experiences, and particularly at the high school level. The interaction with a masonry company at the state competition became a pivotal turning point in her academic career. The idea of taking a skill such as masonry and translating that into an academic major such as construction technology, allowed her to continue working towards a major that she might not have considered without this experience.

Mia experienced a similar outcome after taking an agricultural mechanic's class in high school. During this class, she completed a unit on welding, and was urged to compete at the state competition for high school welding.

> I took an agricultural mechanic's class, and we were on the topic of welding. My teacher urged me to compete at SkillsUSA, and whenever we started that I just completely fell in love with it, so I knew I wanted to do something with metalworking, like welding or machining. And knowing that <college name> has one of the best welding programs locally, I knew that's where I wanted to go for machining.

Mia's educational journey was impacted by this experience, directing her towards an associate in applied science in Welding which she had not considered until she was exposed to it in a class at her high school. Her instructor encouraged her to compete at SkillsUSA, which seemed to further cement her choice in academic major.

Ava offered an additional narrative about the role of SkillsUSA in the choice of her academic major, and a bit about the impact on her professional career prospects. In the example of Ava, she provides evidence that she entered into college with a distinct advantage over students who did not participate in SkillsUSA at the high school level. She speaks to the background knowledge she acquired through involvement in SkillsUSA, significantly impacting her confidence and decisions. Ava stated,

> I guess just the knowledge of, going into college, I already had background knowledge of my field because of SkillsUSA. That's how I got internships and things like that through competing, because there were so many companies that would go to the competitions and kind of seek out people to work for them and things like that. And you get to talk to people in the industry and everything like that. So, I had already had internships before I went to college, so they kind of helped me through my college "journey", I guess you would say, because I had

> background knowledge of construction. So that would probably be my biggest takeaway is just having background knowledge of what I wanted to do.

Ava's account attests to the transformative impact of her involvement in SkillsUSA, particularly in the context of her college journey. Her prior experiences in the organization equipped her with crucial background knowledge in her field, which enabled her to enter college with a head start.

Eva's academic journey reflects pivotal moments of self-discovery and redirection that many students encounter during their pursuit of higher education. Initially embarking on a path in civil engineering at a university, Eva's transition to online learning posed considerable challenges, prompting a reevaluation of her chosen field. The realization that engineering wasn't aligned with her preference for hands-on work led her back to a local community college. It was there, through her involvement in SkillsUSA and participation in events like state competitions, that she unearthed her passion for Heating, Ventilation, and Air Conditioning (HVAC). Eva's states,

> I was going to <university> for civil engineering actually. But when it went online and stuff, that was really hard for me. And then just, I think engineering in general, I figured out wasn't really what I want to do, because I like a lot more hands on compared to sitting behind a desk. I transferred back to my local community college and got involved in SkillsUSA. The events like state and nationals helped me figure out that I wanted to work in HVAC. I never knew enough about it to know that it was something I would enjoy.

Eva's story is a testament to the evolving nature of career and academic major aspirations and the power of experiential education. Returning to a local community college, her

engagement with SkillsUSA and participation in state-level events provided the clarity she needed. It was within these experiences that she discovered her passion for HVAC, a field she previously knew little about.

One final example from Ivy exemplifies the transformative influence of the automotive program at her school and her participation in SkillsUSA. Her deep-rooted passion for cars and the automotive industry led her to explore SkillsUSA, seeking a platform to refine her skills and interests. Her testimonial reflects how SkillsUSA played a pivotal role in clarifying her academic major choice by aligning her interests in cars with an academic pathway that matched her interests. Ivy shared,

> The automotive program here at my school, which that's one that really drove me towards SkillsUSA. I've always been around cars my whole life, and the automotive industry, and it's what brought me to SkillsUSA. I think SkillsUSA really helped me figure out exactly what I wanted to do in the automotive field.

Ivy's narrative highlights the dynamic interplay between her college's automotive program and her involvement with SkillsUSA. Her lifelong fascination with cars and the automotive industry initially drew her towards this path, but participation in SkillsUSA helped her to pick a specific academic major allowing her to explore her intrinsic interests.

Retention

Lia's narrative vividly illustrates the profound influence of SkillsUSA on her educational journey. Amidst the hustle and bustle of academic life, SkillsUSA, with its competitions and activities, emerges as a transformative force that has not only kept her engaged, but also ignited her enthusiasm for further education. This introduction

highlights the pivotal role that SkillsUSA played in sustaining her academic pursuits and the impact on retention for Lia. She shared the following,

> But having the opportunity to be in SkillsUSA and still competing and going to different conferences, that's definitely made me want to go to school because I know how much fun and how much of a good opportunity that each event is. So that's definitely kept me going because I think without SkillsUSA, I'd be out the door, already graduated early probably.

Lia's quote discusses the role of SkillsUSA in her educational persistence. It appears that her engagement with the organization not only sustained her academic career, but instilled a sense of excitement and appreciation for the opportunities if offers. Lia implies that without SkillsUSA she is unsure of what her educational trajectory might have led towards.

Another example from Ivy speaks to the motivation that participation in SkillsUSA provided her to wake up early instead of sleeping in as she would normally enjoy doing. Ivy shared,

> There's days, even if I don't feel like coming to school, if I know I have something SkillsUSA related, it pushes me to want to go, even if it's me waking up at 3:30 in the morning to go to a competition when normally I get to sleep in. I'm still excited and looking forward to going to SkillsUSA, because it fills me with happiness.

This testimony also speaks to the impact of SkillsUSA on Ivy and her academic journey. It is evident that SkillsUSA served as a powerful motivator, compelling her to attend

school with unwavering commitment, even on days when she could opt for extra sleep. Ivy went on to share,

> I would say it definitely gives me more motivation to make sure my grades stay well. Because obviously if your grades go down, you're not going to have as much time to participate in SkillsUSA or you're not even going to be able to participate at all at certain times. So, I feel like it gives you that extra motivational push to know that if you keep these grades good, you get to continue to participate in SkillsUSA.

This quote emphasizes that her involvement in SkillsUSA serves as a strong motivational factor for maintaining good grades. She acknowledges that a decline in academic performance would hinder ability to participate in SkillsUSA, and in some cases, could even prevent her from participating entirely. Other participants shared similar thoughts, often comparing the feeling to that of a college athlete that would be benched for low grades.

Role of Coursework

As described in chapter two, SkillsUSA is a co-curricular student organization designed to operate in tandem as an extra-curricular club, but also building off what happens inside of the classroom. Ada shared the following about her experience,

> I was taking the architectural drafting class this semester and I've had blueprint reading last semester, so I was like, "Okay, I got this construction technology competition in the bag. I know what I'm doing." It's harder than it looks though. You have to let the things that you've learned in class help you to feel confident in competing. I think I was better prepared than I thought.

Ada's reflection highlights her realization that familiarity with related subjects does not necessarily ensure an easy journey, but they can help you to feel prepared and ready for a competition or other club activity. Her optimism stemming from prior classroom experience with blueprint reading empowered her to have the confidence to participate in the related construction technology competitions within SkillsUSA.

SkillsUSA In the Classroom

Building on the co-curricular nature of SkillsUSA, participants often spoke of the importance of learning about SkillsUSA within their coursework as a way of discovery for them leading to participation in the organization, or directly in competition. Zoe shared,

> The first semester I was here, I took a class called Computer Technology. In that course, they made you create a design to submit to SkillsUSA. That was the whole purpose. You would research SkillsUSA, and you figured out what they were made of, and then you had to make a design based on that. So, our assignment was to do that. That's when I first initially heard of SkillsUSA.

Zoe's journey with SkillsUSA commenced during her first semester through a computer technology course. Having assignments that relate to SkillsUSA also led to her involvement and exploration of the organization. Zoe's narrative serves as an example of how academic assignments can help to foster involvement in SkillsUSA, but also lead to unexpected and enriching discoveries, ultimately influencing a students' path and interests. Zoe went on to place at the state level for her designs created in her initial computer technology course. This one classroom assignment started a journey leading to state level attention and resume building for Zoe.

Research Question Two

Within this section, our focus moves to the research question: *How do women in STEM perceive the role of SkillsUSA in their persistence in STEM programs?* This inquiry dissects narratives to create a better understanding of how women in STEM tell the story of the impact of SkillsUSA.

Competition

The general theme of competition emerged as a prominent theme that significantly impacted participants. SkillsUSA provides members with many differing competitions that vary in format and requirements, all designed to enhance the skills, knowledge, and employability of students as they prepare to enter the workforce. Through a comprehensive document review, it is apparent that the competition aspects of SkillsUSA are optional for members, although highly encouraged. Competitions are structured to primarily take place at the state and national level, and the experience in each of these environments is described in distinctly different ways amongst competitors.

Below, Ava provides insight into the enthusiasm she experienced participating in competitions at several levels. In her narrative she describes local competition at the Rowan County Fairground and relates it to her experiences at the regional SkillsUSA competition. Ava states,

> My favorite activities were mainly competitions. My chapter went to regional, state, and nationals. There's a regional competition at the Rowan County fairground. That one's so much fun because there's so many different trades ... It's like a mini version of states. And that one's really fun. Just going to competitions

> is just the best and getting to see those things, all the different skilled trades on display. -Ava

Competition for Ava provides a thrilling and engaging atmosphere that she finds to be the best part of her SkillsUSA involvement. Her experiences highlight the joy and fulfillment that can be derived from competition, and the exposure to other skilled trades which is a large part of any SkillsUSA event. Being able to observe many different fields helps to underscore the multifaceted nature of SkillsUSA and the varied experiences it provides to its participants.

Lia provides insight into her feelings regarding competition and discussed the transformative influence of SkillsUSA on her career in educational technology. Lia states,

> I really like Skills USA and the competitions that they do and just the experience and just everything that comes with competitions, like meeting people or competing, things like that. And I really think that that's kind of where I decided. I was like, "Hey, I kind of want to keep doing this or teach other people or get other people involved in maybe Skills USA or get an apprenticeship." Things like that because competing is just what I enjoy doing and everything. And I'm kind of good at it in a way, you know? So, I feel like I could teach other people to do it as well. - Lia

Lia's experiences within competitions, including meeting new people and the sheer joy of competing, have ignited a passion for the organization. The quote also conveys a desire to share this enthusiasm and knowledge with others, either by getting involved in SkillsUSA, or by encouraging them to pursue apprenticeships. This perspective

emphasizes how participation can not only shape one's own journey, but also inspire the desire to mentor and guide others along a similar path. In Lia's narrative we see the organizations potential to foster leadership and a sense of responsibility among its participants.

During a focus group discussion with Ada and Eva, Eva summarized her overall interpretation of competition with SkillsUSA by stating,

> "I mean, I knew in construction, especially in construction, you've got drones everywhere now. That's like a new technology, surveying the land and taking progress pictures. So, I think with SkillsUSA, you compete and since we placed, you actually get to put that on your resume and say, "Hey, I placed third in nationals for flying drones." When you try to pursue a career in that or even a side hustle in it, people would be like, "Oh, wow. You know what you're talking about." – Ada / Eva Focus Group

Eva's comments emphasize the practical advantage of participating in SkillsUSA competitions, especially in dynamic industries like construction technology. Their discussion centers on the use of drones, a modern technology employed for tasks such as land surveying and progress photography. Eva asserts that placing in the competition provides participants with a notable credential for their resumes, which not only validates their proficiency, but also opens doors for future career opportunities. Eva's summary demonstrates how competition can offer students more than just skill development, but concrete achievements that can set them part in their chosen fields.

State Level Events Facilitated Connections and Friendships

The overarching theme of competition is sometimes separated from the state and national events that occur within SkillsUSA. Depending on the subject matter, students may compete at a regional, state, or national level. For the participants in this study, most compete directly in states after preparing for a year in their respective courses. States are held in Greensboro, NC each spring allowing for students to participate in professional development activities as well as competitions.

One of the most impactful parts of the state competition is described in the following narrative from Ivy. Her experience at the state level event served as a microcosm of the broader SkillsUSA network, where students have the opportunity to interact with peers from different regions within the state. Ivy describes how these events facilitate connections and friendships among participants from diverse geographical backgrounds and demonstrates a bit about the overarching experience of SkillsUSA. Ivy states,

> And when you go to the State Leadership workshops, it mixes you up with schools from all across the state. And you may not have anybody in your group from <hometown>. I don't think I knew anyone I was with at states. And I met a lot of people there from across NC, from the coast to the mountains. And I made some friendships there too as well. The state competition is great because even though people may be from other parts of the state, they are still close enough that you can make friends, and the industry partners are somewhere in NC, so you never know what might turn into a job.

Ivy placed 14th in the state in Automotive Technology, and her participation in the state leadership conference helped to prepare her for an internship she completed the following summer.

Ava offers a glimpse into the journey that led her to become involved in SkillsUSA, particularly her interest in Masonry. Although Ava's primary area of study is construction technologies, through SkillsUSA she developed skills in Masonry and competed in the hands-on bricklaying and masonry design competitions. Her story unfolds as she reflects on the moment when her interest in SkillsUSA was sparked, revealing how a single event set the stage for her continued and longer-term involvement with SkillsUSA.

> So, I was like, "Why not?" You know, experience it all. And so, I went to one of the events and I decided that's kind of where it sparked my interest for masonry. So, I started competing the year after, because I had gone to that competition my freshman year. So that's how I got involved in Skills USA. -Ava

Ava's journey into SkillsUSA began with an initial curiosity. She decided to explore the organization and attended the state competition in her freshmen year. The experience kindled her interested in the masonry competition, prompting her to delve deeper into the world of SkillsUSA by competing herself in the following events. Ava's experience highlights the pivotal role of curiosity and exploration in a student's journey within the organization, ultimately shaping their interests and experiences.

National Level Events

National level events for SkillsUSA are held in Atlanta each summer, usually right after the end of the academic year. This event brings together SkillsUSA members from

all over the nation who have placed within the top three in all their respective Skill competitions. It also provides an opportunity for students to experience leadership development activities, and network with their peers. National competitions also feature a unique social networking activity that participants refer to as Pin Trading. Pin trading is a long-standing tradition in the organization that dates back several decades. Each state develops a pin design and produces pins based on the winning design, issuing five to ten pins to each member who is going to nationals. SkillsUSA members then display their pins for trading while walking around the conference, each member having the goal of collecting all the various pins from each state. This activity often forces members to socialize with each other and approach members they do not know to trade pins.

Three of the participants had never left North Carolina before their trip to nationals. Much of the experience for these participants might be attributed to the act of leaving the state and traveling together as a group. Ivy shared the following regarding her experience with nationals,

> I would definitely say, probably my favorite memory is in the last year we got to compete at national conference, and I got to spend a weekend in Atlanta, Georgia with some of my closest friends from school. And it brought me closer to them and also brought us closer together as the SkillsUSA team and that's probably what I've enjoyed the most so far.

For Ivy, the experience of spending a weekend with her friends seems to have deepened the connections she experienced amongst her existing friends from her institution, creating a sense of unity with her SkillsUSA team. Ivy's narrative underscores the

significance of these shared experiences in bringing people together, both individually and as a part of a collective team.

Eva's perspective on the national SkillsUSA event highlights some of the multi-faceted experiences that the event offers to participants. Beyond the core competitions and skill-based events, she found that the event provided a rich tapestry of activities and opportunities for interaction. Eva shares,

> I think nationals is best, just because there was a lot of stuff to do outside of your competition, like the pin trading and just meeting a bunch of new people. Which I thought that was great.

Eva's description of SkillsUSA Nationals emphasizes the event's diverse offerings. She found it to be an enriching experience due to the myriad activities available beyond the competitions, and highlights pin trading as a catalyst for connecting with peers.

Ava, who first experienced competition with SkillsUSA as a freshman at the state level, also went on to compete at the national level. She shared the following regarding her experience with national competition,

> My favorite accomplishment would be becoming the first back-to-back female champion in post-secondary masonry for SkillsUSA. They were tough competitions, but they will always stand out in my memory as being a proud moment. – Ava

Ava's most cherished accomplishment is her status as the first back-to-back female champion in post-secondary masonry within SkillsUSA. Beyond its personal significance, Ava's accomplishments carry broader implications, inspiring others, particularly young women, to pursue their passions and break barriers within traditionally

male-dominated industries. Her story demonstrates the transformative and pioneering potential of SkillsUSA, where students like Ava can explore their interests and achieve milestones that set an example for others in their chosen vocation.

Ava also reflected on the power of connection and camaraderie experienced at the National competition. Another example of pin trading as a catalyst for social networking at the national level, Ava's story is an example of the transformative powers of a national level event. Ava states,

> Yeah, I knew several people from our school. But as far as nationals, I mean, you meet a whole bunch of new people just trading pins. You know what I'm saying? You have to talk to people to trade pins. I met a lot of people by saying hello and trading pins. Nationals lets you do that kind of thing, which is an awesome way to break the ice for all of us who don't know each other.

Ava makes it clear that the act of trading pins at nationals becomes a kind of unifying force that connects people through conversations. Her experiences demonstrate how nationals creates a unique space for participants to forge connections, which enriches their overall experiences.

Job and Career Implications

Aspects of participation in SkillsUSA also seem to have an impact on the understanding of job and career possibilities. This can be broken down into aspects relating to general career goals as well as internship opportunities. Beyond the competitions, events, and skill development aspects of SkillsUSA, it can also serve as a catalyst for the vocational trajectories of its members. Some of this might be attributed to the organization's ability to equip students with the essential skills to perform a wide

variety of occupations, but also by the sheer exposure to so many different types of careers and the language around those careers. When reflecting upon her general memories of SkillsUSA, Ava shared,

> Well, I would definitely say that, if anybody has the chance to get involved in Skills USA, then they won't regret it because it's probably one of my favorite things about whenever I was in community college. That's one of my best memories and just what made me decide what I wanted to do with my life or what career I wanted to pursue. So, it kind of already set me up for a lot of things and really has helped.

Ava expressed the general impact that SkillsUSA had on what she wanted to do with her life and career. She also discusses how SkillsUSA "set her up for a lot of things," which speaks to the multifaceted impact of SkillsUSA, going beyond the competitions and skill development and into the area of personal and career growth.

Career Goals

While competing at SkillsUSA, Ivy determined that she wanted to go directly to work after she concludes her associate degree at her community college. She also stated her intentions to own her own garage one day but wanting to work at a dealership or regional repair center for Dodge first to gain experience. Ivy's reflection below speaks to a pivotal realization that she experienced during her time with SkillsUSA. Her narrative discusses how participation in SkillsUSA, and her classroom work have converged to shape her perspective on her career. Ivy states,

> I think when I participated in the state conference last year, it really hit me that through Skills USA and through what I'm learning in the classroom here, that this

> is going to truly be my job one day and this is people's careers and that I'm going to pursue this career as well. And I feel like it really hit me that this isn't just a class, this is really helping me all around.

Ivy's account summarizes the power of the experiences that she's had with SkillsUSA and speaks to the importance of the co-curricular nature of SkillsUSA to help students achieve their intended outcomes. For Ivy, SkillsUSA is not merely a club to join, but rather crucial building blocks for her future career.

Lia experienced similar realizations during her time with SkillsUSA, but in this case it helped her to discover her passion for education and impacted her decision to focus on educational technology. Lia explains,

> It definitely contributed to my career goals. When I got in SkillsUSA for the first time back in high school, I was in 11th grade, and I didn't really know what I wanted to do after high school. But after seeing my advisors (faculty members) lead kids in that environment, I realized that that was something that I was interested in. So just seeing how they interact with kids and the positive outlook they've made on their lives made me realize that that was something I was interested in, something I wanted to pursue after community college.

In the example of Lia, her involvement in SkillsUSA was instrumental in clarifying her career direction. Her journey with SkillsUSA started in High School and continued to her community college pathway. Her statements imply that her exposure to educators (assumed SkillsUSA club advisors) helped her to discover her passion for working with students. Witnessing the positive impact, they had on student's lives ignited her interest in pursuing a career in education. Lia's story is another testament to how SkillsUSA can

serve as a catalyst, guiding students towards their true calling and providing clarity about their future career paths.

Internship Experiences

One of the most important impacts of SkillsUSA, often as a part of networking with employers, is the internship opportunities that can emerge for SkillsUSA members and competitors. The following account from Mia highlights the remarkable networking opportunities that SkillsUSA can provide, in this example serving as a bridge between the regional events and potential employers. Mia shares,

> Yeah. Before I even planned on going to nationals, I met somebody that works for <company name> at the regional SkillsUSA event. He's one of the employees that hires people and stuff. He took me to <company name> and I was telling him about how I'm going to have to do an internship for my associates degree, and he said, "Whenever you're ready, just let us know." So, I feel like I'm going to have a good shot at getting my internship at <company name>.

Mia's story unveils the potential and power of networking. Her encounter with an employee from a company at the regional event resulted in a connection that could lead to an internship. This story demonstrates how the co-curricular nature of SkillsUSA has the ability to impact students in a way that might not occur within the traditional bounds of a classroom.

Ava was able to earn an internship through her advisor's SkillsUSA connections. Below she reflects on the impact that internship had on her.

> you understand everything a lot more after you've had an internship, or you've worked in that field or even competing. I knew a lot about masonry and

> everything, but I also knew how construction works through having that hands-on experience.

Ava emphasizes the profound impact of experiential learning, and her words underline the importance of practical engagement in gaining holistic comprehension of a field. This testimony underscores how internships, hands-on work, and competitions are instrumental in bridging the gap between the theoretical knowledge that is taught in the classroom, versus the real-world application which can be difficult to simulate inside the classroom.

Research Question Three

In this section we explore the impact of SkillsUSA as framed by the third research question: *What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM programs?* The majority of the collected narratives feature some type of emphasis on interpersonal relationships with either the SkillsUSA advisor, or peers within the SkillsUSA chapter. Themes of school pride and community service also emerge.

The Importance of Relationships

A major recuring theme from this study is the importance of relationships, and the various ways that those relationships impacted students on their educational journey. Zoe noted that there seemed to be an increase in women in her program, and at the SkillsUSA club meetings, which had a positive impact on her experience. Zoe shared the following regarding how she made friends with other women in SkillsUSA,

> Well, they were a part of our program, but I had never met them before since they were both online students. Then I also met another student, but she was a year

> behind me, so I don't really know her that well yet, we were never in classes together. So, I got to meet them all in person at SkillsUSA. Well, I actually got to meet three people, now that I'm thinking about it. I got to meet three people at SkillsUSA that were from my college, which is really nice. I felt a little alone at first, but it's nice to have friends now.

Zoe's story highlights the positive experience of meeting people and building a network through participation in SkillsUSA. She also stated that even if some members were absent from the meetings, that they would sometimes meet on their own just to catch up. This underscores the importance of creating a supportive and inclusive atmosphere within extracurricular organizations, which can enhance the overall experience for all participants and contribute to their ongoing engagement.

The Role of the Instructor/Advisor

Eva's instructor, who we will refer to as Larry, played a crucial role in introducing her to SkillsUSA. Eva's recollection offers insight into the pivotal role of educators and mentors in guiding students towards enriching activities, in this case through SkillsUSA. Her mention of Larry below demonstrates the importance of supportive and encouraging mentors. Eva states,

> He was like, "Do you want to do SkillsUSA?" And it's something that I had heard about in high school, but never really had time with or time for, with sports and everything. And when Larry was asking me about it, I was like, "Yeah, it sounds like fun. I'd be interested."

In this example, even though she heard about SkillsUSA in High School, she had not found the time to participate, and maybe didn't know a great deal about what it meant to

participate in SkillsUSA. Larry's encouragement sparked her interest and shows the vital role of mentors and educators in guiding students that can open doors to new opportunities and interests.

During a focus group with Ada and Eva, Ada shared a similar sentiment regarding the relationship with her club advisors for SkillsUSA. In this example she is specifically speaking about the experience of going to state and national conferences with them, and getting to know them in a different way than they might typically during a class. Ada stated,

> I think for me, I can say the same thing. I had Mr. <Bob>. He was the lead instructor for the drone competition that I did at Nationals. And being able to be with him at state one-on-one, you kind of get that bonding with the faculty member. And then also with nationals, I mean I've talked with my instructors, but I never really did, unless I needed something, but to actually get to know each other for a whole week, sit down and eat dinner together, that really makes you feel like you know them. – Ada Eva Focus Group

Ada's example speaks to the relationships that form between instructors and students through participation in SkillsUSA. Ada's example of the one-on-one interaction at the state level, and the later interactions at the national level helped to foster a sense of connection, even using the example of eating meals together with students and instructors and the impact that can have on the relationship. This reflection highlights the relationship building aspects of SkillsUSA events, and how they often go beyond academic interactions to foster personal connections between students and faculty.

Lia's provides some insight into the dynamics of gender representation within SkillsUSA at her school. It underscores the existence of gender diversity within the organization, particularly in the high-tech areas. Lia's experiences also emphasize the critical role played by supportive mentors and the power of peer encouragement in expanding participation amongst women. Lia shares,

> The big SkillsUSA side of things at our school is automotive. So, it's definitely a bunch of guys. But there's also the IT side of things, like the technology side. And that's where I got started. And luckily enough, we had a female advisor. So, I wasn't really as nervous going in because there were two or three other girls my age in it. And then as I got into it and we kept telling more girls, "Hey, join this. It's not just for the boys," we grew into a real big club at our school. – Lia

Lia's narrative reflects on the gender dynamics within SkillsUSA at her college, highlighting that the automotive side of the organization is predominantly male. Lia attributes her comfort with participation to the presence of a female advisor and the support of a small group of women her age who were already involved. As the club grew, these young women actively worked to encourage others to join. This account emphasizes the evolving and inclusive nature of SkillsUSA, where mentorship and peer support play vital roles in fostering gender diversity and ensuring that students, regardless of gender, feel empowered to participate and succeed in the organization.

When asked about the impact of her SkillsUSA Advisor, Zoe spoke to the mentorship and the influence of her instructor, who served as the club advisor. Zoe shares,

> I would say, knowing that <instructor name> had his faith in me honestly helped me want to go. Because, if someone were to tell me, "Oh, do you want to do this?" I was like, "Are you sure I can?" and if they said, "No," I would probably say, "No way I'm competing." So, his confidence in me did help me a lot to want to participate. It always helps to have someone that believes in you! - Zoe

Zoe attributes her motivation to participate in SkillsUSA to the unwavering faith and confidence that her advisor had in her abilities. She contrasts how someone else's uncertainty might have deterred her, but her advisor's belief in her capabilities was instrumental in her decision to engage with the organization. Zoe's story speaks to the influential role that mentorship and support can play in encouraging students to take on challenges and embrace opportunities. It emphasizes the significance of mentors who inspire and empower students, fostering participation and personal growth.

Peer Relationships

Peer relationships emerged as a meaningful sub-theme of relationships within SkillsUSA. Peer relationships are a vital component of many organizations culture and contribute to the personal and professional growth of their members. Within SkillsUSA, there are often ideals of collaboration and teamwork, mentorship, friendship, and leadership discussed in documents created and shared by the organization. The participants of this study demonstrated that peer relationships played an important role in shaping their experience, and their willingness to continue with SkillsUSA. Eva and Ava both shared examples of meaningful peer relationships, mostly in the form of friendships.

In the following quote, Eva shares details about her interactions with Joe and Kyle, both engaged in HVAC-related competitions, as an example of how SkillsUSA can

bring individuals together, encouraging post-event socialization and potential future interactions. Eva states,

> Well, I think with Joe, the participant that did HVAC and Kyle, I've never really talked to them before this, but now we've talked about hanging out again and stuff, after skills. So, it's just built a couple friendships there with people I've seen in classes, but never really had conversations with. -Eva

Despite not having conversed with them previously, they shared experiences of competition and the SkillsUSA environment-initiated conversations and the prospect of socializing after the SkillsUSA event. Eva's account emphasizes the role of SkillsUSA in building connections among individuals who may have been in the same class at some point, but never engaged in conversation. In this example, fostering friendships and expanding social networks outside of the classroom was a defined benefit of participation.

When asked about relationships with her peers, Ava shared an experience that involved the role of social media in connecting students from different parts of the country after meeting at SkillsUSA. The description from Ava explores the unique way that relationships are formed, but also maintained amongst SkillsUSA participants. Ava shares,

> There's this one girl in Texas, she won her high school competition last year and she was at the national competition. So, we kind of connected because I had seen her instructor post her on their masonry Instagram. And so, I kind of knew her before going to nationals and everything. So, it was kind of cool to meet her and

> be like, "Hey, I already know you because of social media, you know, so weird that I feel like I know you, without meeting you. Hi, I'm Ava. – Ava

Ava's recounting of her experiences connecting with a student from Texas sheds light on the social aspects of competition. What makes this connection noteworthy is that Ava had already been made aware of this student through social media, creating a sense of familiarity before they even officially met. This allowed Ava to form a fast friendship with someone from another region and already have a sense of camaraderie even though they had never met. The shared experience of SkillsUSA and competitions allowed them to relate to each other, despite regional and age differences.

Extra-Curricular Nature of SkillsUSA

Career and Technical Student Organizations are positioned to exist both inside and outside of the classroom (Cilauro, n.d.; Maldonado & Jaeger, 2021; *SkillsUSA Championships (Career Competition Events) - SkillsUSA.Org*, n.d.; *SkillsUSA.Org*, n.d.; Threeton & Pellock, 2016). The activities of such organizations are typically voluntary and require a student to elect to participate. The participants of this study discussed many aspects of their interpretation of SkillsUSA both inside and outside of the classroom.

SkillsUSA as a Club

SkillsUSA is a co-curricular student organization, primarily meaning that there are both classroom and student club aspects to running a successful chapter of the organization. The chapter management guide suggests that many of the activities within the organization, including competitions, are most likely to be successful when students are engaged in both classroom instruction, but also outside of classroom practice and

reinforcement. The participants of this study seemingly recognize the co-curricular nature of the SkillsUSA experience.

Eva's statements touched on the dynamic interplay between classroom education and practical application, with a focus on her experience at her college. She highlights the uniqueness of SkillsUSA, which allows her to bridge the gap between theory and practice and explains how this aspect makes SkillsUSA a valuable and enjoyable experience. Eva shares,

> Honestly, SkillsUSA is pretty great, because at <college name>, I just go to class, which the classes are great. I love having the hands-on part of it and it really helps me keep focus. But I think Skills is fun, because it was putting what I learned in class and actually using it for something. Competitions gave me a space to try out the skills I've learned – Eva

Eva emphasizes the distinctiveness of her SkillsUSA experience by comparing it to her regular classes at her college. While she appreciates her academic coursework, she finds SkillsUSA to be particularly enjoyable because it enables her to apply the knowledge she gains in the classroom to practical, real-world scenarios. The hands-on aspects of SkillsUSA not only captures her interest, but also helps her maintain focus. Eva's observation underscores the importance of practical application in learning and how a co-curricular organization can serve as a platform where students can put their academic knowledge into action.

When asked about the club aspects of SkillsUSA, Zoe also highlighted the impact of having outside of the classroom experiences as being an impactful part of SkillsUSA. She acknowledges the value of engaging in conversations with others about her specific

area of expertise within the competition she is planning to engage in at the state level conference. Zoe shares,

> Getting to talk to people about my specific piece of the competition was really nice, because it's confusing if you don't understand the context of what you're doing in the greater world, so it was really nice to just talk about it and be able to have that outlet and place to practice. - Zoe

Zoe underscores the importance of communication and dialogue within SkillsUSA. In this example, the ability to work with her SkillsUSA team and the other members in it gave her an outlet to discuss her particular skill. Through these conversations she not only gains a better understanding, but also hones her communication skills. Zoe's perspective emphasizes how SkillsUSA can provide a platform for reinforcing skills outside of a traditional classroom environment.

Chapter and School Pride

Chapter and school pride was also identified as a sub-theme in this study. The competitive nature of SkillsUSA was discussed amongst the participants as a motivating force to drive students to excel not only for their own personal achievement, but also for a sense of honor and reputation for their educational institution. In the context of competitions like SkillsUSA, school pride is discussed as a deep emotional connection and allegiance that the participants feel toward their institution. This feeling of connection could be summarized as a sense of belonging and motivation similar to a way in which a sports team or school athletic event might experience school pride.

In the following quote, Zoe articulates her strong sense of school pride and support for her college's other SkillsUSA participants. She highlights enthusiasm

encouragement that she feels for her college's representatives at the SkillsUSA state competition. Zoe shares,

> Honestly, when I heard other people from our college, it made me have a sense of pride. Every time they went up there for an award, I screamed. Me and a group of people that were there, we were just screaming for our school. The only thing was, we need to get more people up there because it was other regions who were beating us a lot. It meant a lot that we got the top gold medal though! – Zoe

Zoe expresses a deep sense of pride and school spirit when discussing her college's representation at SkillsUSA. She is enthusiastic in cheering of others and her excitement is palpable as she emphasizes the need for her community college to perform even better in SkillsUSA competitions. She aspires to see her college achieve top level recognition, which highlights the competitive spirit and aspirations that SkillsUSA fosters, motivating students to strive for success and recognition in their respective fields of expertise.

Community Service

Another theme that emerged was the impact of community service projects. Most SkillsUSA chapters conduct some type of community service projects throughout the academic year. SkillsUSA describes their community service initiatives as an activity that aligns with the mission to develop well-rounded individuals who are not only skilled professionals, but also responsible community members. Many chapters try to foster a culture of giving back, and SkillsUSA encourages students to apply their skills and leadership abilities to make a positive difference in the world beyond their classrooms. There is a great deal of variety between the differing colleges in terms of their level of community service engagement.

Lia provided insight into her experiences with SkillsUSA community service by discussing her chapter's involvement with a local food pantry, showcasing the organizations dedication to making a positive impact in the community. Lia shares,

> And another thing that we worked on at our chapter, we go to the *Make a Difference Food Pantry* each year, and we get to volunteer there. We take a whole group with us every time we go. We'll go out there and volunteer around Thanksgiving because that's when it's real busy, whether we're organizing clothes or food or serving a hot meal, just different stuff like that. Volunteering at that food bank has been something that I've really enjoyed. -Lia

Lia describes their participation in the food pantry as a robust experience including a wide variety of activities, from organizing clothes and food to serving hot meals to those in need, particularly during the busy thanksgiving season. Lia's story emphasizes the profound fulfillment and satisfaction derived from engaging in such community service initiatives. Through community service, students like Lia gain valuable experiences that extend beyond their technical and professional skills, nurturing growth as responsible and compassionate community members.

Lia enjoyed the food bank experience a great deal, so she worked with other SkillsUSA members to organize other community service activities. Lia provided the following description of a community library that was built by her SkillsUSA chapter,

> One of my favorite things that we've done is put a community library at one of the local restaurants. It was fun to build it because you try to have a big group of people trying to build one little library. That was interesting. But being able to put that up for the community and just seeing how or I guess seeing the impact it

> made on them, we've had people already ask, "Hey, can you put one on this side of the county?" And stuff like that. So just knowing you made a difference in your community where you can see people using the library. – Lia

Lia highlights the collaborative and hands on experience of constructing the library with a large group of participants. The impact of this endeavor becomes evident as members of the community express their appreciation and interest in expanding such initiatives to other areas of the county. Lia's account demonstrates the tangible and meaningful contributions that SkillsUSA chapters can make through dedicated community service activities, and the impact such actions can have on the chapter's membership.

Cost and Financial Implications

The co-curricular and competitive nature of SkillsUSA has quite a few travel implications for participants. Although not identified as a barrier, the cost and financial implications were discussed amongst the participants. In this quote, Mia discusses the financial aspects of being a student in SkillsUSA but points out the importance of community involvement by highlighting the discounts that were given to her. Mia shares,

> "Luckily we have places that give us discounts for being students at <college name> so it wasn't that pricey, but it still was a big list of things I had to spend money on." - Mia

While she recognizes the value of the discounts given to her, she hints at the broader financial challenges involved in co-curricular student travel. Her quote emphasizes the importance of financial planning and support. SkillsUSA advisors should be aware of the

financial considerations that students like Mia navigate while trying to participate in organizations such as SkillsUSA.

One college in the region under study worked hard to ensure that all costs were covered for students. Eva shares the following regarding her experiences,

> Nope, because the school covered all the money issues... Or the club I guess, or SkillsUSA. I don't know exactly how they did it. I didn't really have to pay for anything and filling out paperwork to get everything covered was not hard - Eva

Eva emphasizes that she did not have any financial issues related to her involvement in SkillsUSA, attributing that to the college or student club covering the costs of travel and competition. The participants universally acknowledged the high cost of traveling to the state competition in Greensboro, or to national competition in Atlanta. There was a great deal of variety across the region in terms of how different institutions approached this cost.

Suggestions for the Future

During a focus group with Ada and Eva, Eva shared some feedback for future students regarding their participation in SkillsUSA. She emphasizes researching the competition, studying the competition description, and fostering friendships beyond the classroom as two key points for any student considering getting involved in SkillsUSA. Eva states,

> For whatever program they're going into, they should pull up more information on it, see what they need to do, or what they did last year. The competition guide tells you what to work on throughout the year, so you don’t have to start from scratch with whatever subject. And even if they know they're doing SkillsUSA,

> maybe y'all can meet outside the class and you know what I'm saying? The friendships help with SkillsUSA, and it makes everyone be better as a team.

Eva encourages students to take a proactive approach to their participation in SkillsUSA and highlights the importance of being prepared. Her insights emphasize the multifaceted approach to success in the organization, encompassing camaraderie and teamwork. This advice also applies to educators as they consider how to best enable students for success in their role as a SkillsUSA advisor.

In the following quote, Ada reflects on an experience where she was unsure of how to navigate the national competitions. This quote emerged during a focus group conversation with both Ada and Eva as they reflected upon ways to improve the SkillsUSA experience for future students, specifically traveling to state or national competitions. She notes the absence of clear signage or guidance to help students navigate the campus. This quote explores the challenges students may face in terms of communication and direction when they travel to competition or other SkillsUSA events. Ada shares,

> I'm sitting there just wandering around, I don't know where my instructor is at. So basically, I just ended up finding the event myself and they met me there, just so happened. But yeah, it was confusing because they didn't have signs up or just something to tell you where you're supposed to be going. When you're in a completely new place it can be very overwhelming – Ada

Ada's insight points to a need to adequately prepare students to travel to the various competitions. She ultimately located the event on her own, however the need for improved communication and wayfinding systems are clear within her perspective. Both

Ada and Eva expressed that they had not traveled much before the SkillsUSA trips to states and nationals, which could be interpreted to imply that SkillsUSA advisors may need to better prepare students for the environments that they are entering.

Conclusion

This chapter outlined major thematic findings of the research that investigated the influence of an on-campus STEM related student organization (SkillsUSA) on women in STEM and captured the perceptions of the women who participated. Qualitative interviews with seven participants revealed the transformative power of participation in SkillsUSA in shaping both their academic and career choices, and equipping students with valuable skills while fostering personal and professional growth. The findings in this chapter showcase the diverse ways in which SkillsUSA influences students from a wide range of academic pursuits in a way that bridges the gap between classroom learning and practical application.

Chapter 5 provides a summary of the findings, discusses the application of the model of student departure to the interpretive analysis of the major findings, outlines limitations of the current study, and suggests implications for professional practice and future research.

CHAPTER 5: DISCUSSION

Women's participation in STEM fields has long been a subject of concern and scrutiny. Despite advancements in gender equality from a social perspective, significant disparities persist in terms of representation and retention of women in these fields (Beede et al., 2011; Leavey, 2016; Mullet et al., 2017). Understanding and addressing these issues are crucial for promoting gender diversity, fostering innovation, and maximizing the talent pipeline in STEM disciplines (Beede et al., 2011; Cho et al., 2009; Leavey, 2016). Many examples of research exist regarding this topic at the baccalaureate level, often focused on on-campus services, however there is a great shortage of useful research focused on the community college environment, often leaving community colleges without as many tools to support women in STEM. (Blackburn, 2017; Choi, 2022; Griffith, 2010; Hoffman et al., 2010; Ireland et al., 2018; McGee & Bentley, 2017; Miller & Wai, 2015; Thackeray, 2016; Xu, 2017).

The purpose of this qualitative case study was to explore the influence of on-campus STEM related student organizations on the persistence of Women in STEM programs and to capture the perceptions of women who participated in SkillsUSA, which is intended to support the persistence and success of students pursuing a STEM related degree at the community college level. A qualitative case study approach was used to complete this study. This approach was chosen to capture in-depth descriptions of participation in a student organization from the point of view of the student. The following research questions guided this study:

1. What aspects of participation in SkillsUSA are the most impactful for women in STEM?

2. How do women in STEM perceive the role of SkillsUSA in their persistence in STEM programs?
3. What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM programs?

This chapter presents a summary of findings derived from the data outlined in the preceding chapter. Chapter five also engages in a discourse concerning the academic literature around the issues relating to retention and persistence for women in STEM, while outlining the aspects of participation in SkillsUSA that were shown to be impactful for participants. The chapter concludes by outlining the limitations of this study and noting implications for professional practice and future research.

Summary of Findings

This study found that participation in SkillsUSA, a co-curricular student organization, provided substantial supplemental experiences and knowledge that had a perceived benefit to students who participated. As a co-curricular organization, SkillsUSA is primarily intended to support classroom instruction by providing a club like experience for students (Maldonado & Jaeger, 2021; *SkillsUSA Championships (Career Competition Events) - SkillsUSA.Org*, n.d.; *SkillsUSA.Org*, n.d.; Threeton & Pellock, 2016). The major themes uncovered throughout this study speak to the impact on academics, peer and advisor relationships, and how SkillsUSA had the ability to shape a student's career goals and internship prospects.

Discussion of Findings

As discussed in chapter two of this study, there is a great deal of research that demonstrate the effectiveness of women role models, extracurricular activities, early

exposure to math and science, and personal interest exploration on the impact of the success of women in STEM fields (Bergen-Cico & Viscomi, 2012; D. J. Camacho & Legare, 2016; DeAro et al., 2019; Herman & Kirkup, 2017; Hoepner, 2010; McFarland et al., 2018). This study supports all of these findings, and explores the impact that SkillsUSA can have on them collectively. SkillsUSA provides an avenue to expose students to role models of both genders, while having extra-curricular activities that allow the exploration of personal interest through organized regional, state, and national events. Although no solution should be described as a silver bullet, it seems that a co-curricular experience such as SkillsUSA represents an attainable way for community colleges to support women in STEM in the absence of being able to provide some of the dedicated supports often seen at the four-year level such as living learning communities, or on-campus staff supports.

Wickersham and Wang (2016) found that the positive experiences of a living learning community as represented at a four-year institution was the creation of a strong community of peers and the role it played in student success. This study concludes that SkillsUSA proves a valuable tool for community college educators who want to pursue the creation of that community of peers without having the option of a living learning community. All seven of the participants within this study noted it's impact on their ability to build peer relationships, often citing new friendships that were not necessarily situated in the context of their home school, but often at a state or national level. Through the in-person networking aspects of SkillsUSA, participants reported experiencing the formation of a bond within their own SkillsUSA chapter at their school as well.

Alignment with Scholarly Literature

Wang and Degol argue that the underrepresentation of women in math-intensive STEM fields is a wide-ranging cultural phenomenon brought about by the interaction of six underlying factors: (1) absolute ability differences, (2) relative ability strengths, (3) career preferences, (4) lifestyle preferences, (5) field-specific ability beliefs, and (6) gender stereotypes and bias (Wang & Degol, 2017). The math intensive aspect of participation in STEM fields looks quite different in the community college, especially when focusing on an associate in applied science STEM degree which is primarily directed towards skills. This study provides support for the lifestyle preferences and field specific beliefs factors through the thematic findings outlined in the academic major decisions and job and career implications sections of the previous chapter. Wang and Degol assert that overcoming those factors are crucial for women to be successful in STEM, and three of the seven participants in this study outlined the impact of participation in SkillsUSA as a way of determining if a field of study was a good fit for them, or determining if they have the field specific abilities necessary for success. Lifestyle preferences were also impacted by exposure to the opportunities for job and career that are communicated through participation in SkillsUSA.

Numerous indications support the notion that exposure to positive role models during high school and beyond, and the availability of STEM courses can enhance the recruitment and retention efforts targeting women in STEM (Maltese & Tai, 2011). The results of this study support this finding, exploring in detail the role of the instructor/SkillsUSA advisor and how they can impact students in SkillsUSA. This study did not feature any participants who had benefitted from having an advisor who identified

as a woman, however multiple participants discussed in interviews their perceived benefits from having the support of their advisor. It is important to remember that SkillsUSA is co-curricular in nature, meaning that often the instructor for a STEM related class also serves as the SkillsUSA advisor, so in this context the student is experiencing this role model as both a teacher and as an extra-curricular student organization advisor context.

The Theory of Institutional Departure

Tinto's theory of institutional departure, developed by Vincent Tinto examines factors leading to students' decisions to leave or persist in higher education. The theory posits that departure results from interactions between students and the institution. Tinto argues that students' integration into the academic and social aspects of the institution, along with their commitment to education goals, influences whether they stay or depart (Tinto, 1990, 2006, 2017, 2012). Tinto's model has been influential in understanding student retention, persistence, and success in the context of educational leadership.

Tinto's model of institutional departure provides a comprehensive framework for understanding the complex interplay of factors influencing a students' persistence or departure from higher education institutions. The primary argument in Tinto's model is that student's experiences, especially in their first year of college are marked by a series of stages, and persistence or departure is inherently dependent on successful navigation of those steps/stages (Aljohani, 2016). The model of institutional departure has been utilized by many scholars for over 40 years, however it has often centered around the experiences that would be indicative of a more traditional residential four-year university. The primary aspects of student experiences taken into account in the theory are academic

performance, faculty/staff interactions, extra-curricular activities, and peer group interactions (Tinto, 1975, 1990, 2006). In the context of this study, and when applied to community colleges, peer group interactions and extra-curricular activities are often quite different because of the commuter nature of the community college.

In the context of student clubs and organizations, such as SkillsUSA, Tinto's theory of institutional departure remains very relevant and provides some framework for discussing the impact of club experiences. The theory emphasizes the importance of student integration into various aspects of the institution, including academic and social dimensions. Student clubs and organizations can play a crucial role in fostering social integration and a sense of community. In the case of this study, the shared experiences of the participants certainly address the impact of activities through SkillsUSA and their ability to create a sense of community amongst the participants.

Socio-Academic Integrative Moments

Regina Deil-Amen's concept of Socio-Academic Integrative Moments (SAIMs) refers to instances where social and academic experiences intersect, fostering an environment conducive to student engagement, learning, and overall success (2011). The findings of this study suggest that SkillsUSA features many aspects that could foster SAIMs. By providing a platform where students can engage in activities related to their academic interests in a social setting, these clubs create opportunities for meaningful interactions that blend educational pursuits with personal connections. SkillsUSA is dedicated to developing leadership and technical skills, and exemplifies this concept by providing robust support mechanisms that integrate students with their campus and higher education as a whole which could be perceived through the lens of Socio-

Academic Integrative Moments. Through a combination of skill-building workshops, competitive events, and social networking opportunities, SkillsUSA facilitates the intersection of academic and social experiences, fostering a sense of community and belonging among its members. By engaging students in both academic enrichment and social interaction, SkillsUSA not only enhances their educational experience but also strengthens their commitment to their academic and career goals, reflecting Deil-Amen's principles of holistic student development. Consequently, SkillsUSA's initiatives are instrumental in helping students navigate the complexities of higher education, ensuring they are well-prepared for both academic and professional success.

Key Experiences of Participants

All of the participants in this study highlighted the impact of state and national level competitions on their academic major decisions as well as their job and career decisions. A natural conclusion of this study is that the competitive events hosted by SkillsUSA hold the ability to impact students the most as compared with other SkillsUSA activities. Maldonado and Jaeger (2021) conducted a qualitative study to examine the connection between SkillsUSA competitions and the student's preparedness for the workforce, in which participants reported that SkillsUSA events helped them prepare for the workforce by increasing soft skills and confidence. This study supports this finding, and concludes that the competitive events impacted the building of peer relationships which is crucial to social integration into the institution as identified by Tinto's Theory of Institutional Departure (Tinto, 1975, 1990, 2006).

Limitations of the Study

Several limitations were identified in this study. Participants were recruited on a voluntary basis for interviews and the focus group. The utilization of volunteer participants sometimes results in a sampling that may not be representative of the greater population of students that are eligible for participation in SkillsUSA. This study and its findings can only represent the participants under study, and there may be reasons why the findings cannot impact all students such as the time and effort required to participate within SkillsUSA. Many students who are pursuing a community college education are also working full-time, often tending to familial commitments, and working to ensure that they allot enough time to complete coursework (Hagedorn & Purnamasari, 2012; Hu & Ortagus, 2019; McFarland et al., 2018; Mooney & Foley, 2011; Packard & Jeffers, 2013). This delicate balance of work, life, and academic commitments might prevent many students from being able to participate in SkillsUSA, thereby eliminating any benefits that are derived in this study.

Another important consideration is the co-curricular nature of SkillsUSA. Many student organizations are described as co-curricular, meaning that they integrate with the curriculum to supplement the learning that occurs in the classroom (Bergen-Cico & Viscomi, 2012; Maldonado & Jaeger, 2021; Threeton & Pellock, 2016). This implies that if the classroom experience is different, it would also impact the outside of classroom activities associated with SkillsUSA. Variability in course and program design within the North Carolina Community College System (NCCCS) can create different experiences for students within the state. This would play a larger role when considered nationally since many states approach different degree topics in different ways. In the NCCCS

context, there is a curriculum standard for each college which ensures that each college must follow the same naming scheme, course number, and course description for the programs of study.

Implications for Professional Practice

Community colleges face unique challenges regarding recruitment, retention, and persistence of women in STEM fields. This study works to illuminate the benefits of providing students with the opportunity to participate in SkillsUSA, a co-curricular student support organization. Community colleges considering starting a SkillsUSA chapter stand to benefit from the organization's holistic approach to education and student engagement and can truly use SkillsUSA to supplement the education and experiences that are provided on campus. It is the hope of the researcher, that by leveraging the key findings of this study, colleges can create robust SkillsUSA chapters that effectively support student's growth, success, and most importantly, their persistence within STEM.

Effectively incorporating a Career and Technical Student Organization (CTSO) such as SkillsUSA into a Career and Technical Education (CTE) program necessitates CTE instructors to take on roles that extend beyond the traditional teaching responsibilities (Reese, 2003; Stanislawski & Haltinner, 2008; Threeton & Pellock, 2016). This work often requires skills such as teaching, mentoring, guiding, leading, managing, and motivating students outside of the traditional classroom setting that most educators are familiar with. Many times, those responsibilities can also span leadership development, support for competitive events, professional development, community service, along with the administrative burden of running a student organization. These

additional roles and responsibilities can most often benefit from institutional support and assistance to instructional staff who serve as club sponsors. If colleges want to truly provide the best experience for students, they may need to divert funding, or faculty release time to ensure that SkillsUSA is a success.

Colleges may best support their CTSO's by utilizing Perkins Funding through the Perkins V act, also known as the Strengthening Career and Technical Education for the 21st Century Act (Perkins V, 2018). One aspect of Perkins V is its emphasis on the alignment of CTE programs with the needs of the labor market, and local economies. The law requires states to develop comprehensive CTE plans that address the workforce demands to prepare students for STEM related skills-based jobs. The law encourages the integration of academic and technical skills, work-based learning, experiences, and industry recognized credentials. To accomplish these lofty goals, Perkins V acknowledges the importance of career and technical student organizations such as SkillsUSA. This acknowledgement allows both high schools and colleges to use Perkins funding to support CTSO integration into their CTE programs providing financial support for the operations and activities of the CTSO, and student travel as required for state and national competitive events within SkillsUSA.

Recommendations for Future Research

This study worked to capture the impact of SkillsUSA from the perspective of women in STEM who voluntarily participated in the organization. From a high-level perspective, a longitudinal study to track the long-term impact of participation in SkillsUSA on the both the educational and career trajectories of participants could be helpful in understanding the lasting impact of participation. Additionally, a comparative

study that examines the outcomes of women who participated in SkillsUSA, to those that did not could explore the retention rates, academic performance, and post-graduation career paths between these two groups. There are also opportunities to explore the intersectionality of gender with other identity markers such as race, ethnicity, socioeconomic status, and disability within the context of SkillsUSA participation.

From a broad perspective, there is not a great deal of research about Career and Technical Student Organizations, or their impact on persistence, retention, or academic achievement (CTSOS.ORG, 2019; Maldonado & Jaeger, 2021; Stanislawski & Haltinner, 2008; Threeton & Pellock, 2016). These organizations have existed for as long as 90 years in the case of Future Business Leaders of America and have a high level of participation at both the high school and community college levels. This high level of participation provides a large set of participants for any future studies to examine the many remaining questions about these organizations, or how to properly run or administer them.

Investigating the perspectives of faculty members who serve as advisors to SkillsUSA and interact with women participants may also provide some insight into observed best practices, or strategies for enhancing persistence for women in STEM. In addition to faculty, there is room to explore the organizational structures of SkillsUSA and support systems that exist through the state and national organizations for women in STEM, while identifying the specific goals of the organization with regards to persistence and academic performance.

Finally, the changing shape of higher education and it's increasing levels of remote learning will inevitably impact an organization such as SkillsUSA and its ability

to interact with students in a traditional in-person club style meeting schedule on campus. The experiences documented within this study are solely based on the participants ability to attend and learn about their field in person. There may be ways to supplement these experiences with online learning tools, or even by making some of the events virtual. This is an area that has not been explored in recent literature.

Summary

This study explored the impact of participation in SkillsUSA on women in STEM programs at the community college level. Despite considerable research at the baccalaureate level, there is a noticeable gap in understanding the role of community college environments in supporting women in STEM. This study aimed to fill this void by exploring the influence of on-campus STEM-related student organizations, particularly SkillsUSA, on the persistence of women in STEM programs. Through a qualitative case study approach, the research sought to answer key questions regarding the impact of SkillsUSA on participants' experiences and perceptions in relation to their STEM education.

The findings of the study highlight the significant impact of participation in SkillsUSA on women in STEM, particularly in terms of supplemental experiences and knowledge acquisition. Participants identified major themes such as the influence on academics, peer and advisor relationships, and career goal shaping. These insights align with existing literature on the importance of role models, extracurricular activities, and early exposure to STEM subjects in supporting women's success in STEM fields. SkillsUSA emerges as a valuable avenue for community colleges to provide students with

co-curricular experiences that enhance social integration and skill development, especially in the absence of traditional support structures seen at four-year institutions.

This study also emphasizes the need for community colleges to leverage organizations like SkillsUSA to support women in STEM and suggests strategies for incorporating such co-curricular experiences into career and technical education programs. Additionally, the study calls for further research to explore the long-term impact of participation in SkillsUSA, compare outcomes between participants and non-participants, and investigate the perspectives of faculty advisors. Overall, the study underscores the multifaceted impact of SkillsUSA on participants' academic, career, and personal development, highlighting its role as a catalyst for success in STEM education and beyond.

Concluding Remarks

The data produced by this study collectively works to illuminate several key findings regarding the impact of SkillsUSA on the participant's academic, career, and personal development. In essence, these findings emphasize that SkillsUSA serves as more than a platform for skills development; it's a catalyst for career decisions, a source of extracurricular experiences, a challenge that hones the participant's skills, and a community where individuals build meaningful relationships and contribute to the greater good. The multifaceted impact of participation in SkillsUSA resonates across academic, financial, organizational, and communal dimensions, making it a pivotal force in the educational journeys of its participants.

REFERENCES

Aljohani, O. (2016). A Comprehensive Review of the Major Studies and Theoretical Models of Student Retention in Higher Education. *Higher Education Studies*, *6*(2), 1. https://doi.org/10.5539/hes.v6n2p1

Aragon, S. R., Alfeld, C., & Hansen, D. M. (2013a). Benefits of Career and Technical Student Organizations' on Female and Racial Minority Students' Psychosocial and Achievement Outcomes. *Career and Technical Education Research*, *38*(2), 105–124. https://doi.org/10.5328/CTER38.2.105

Aragon, S. R., Alfeld, C., & Hansen, D. M. (2013b). Benefits of Career and Technical Student Organizations' on Female and Racial Minority Students' Psychosocial and Achievement Outcomes. *Career and Technical Education Research*, *38*(2), 105–124. https://doi.org/10.5328/cter38.2.105

Beede, D. N., Julian, T. A., Langdon, D., McKittrick, G., Khan, B., & Doms, M. E. (2011). *Women in STEM: A Gender Gap to Innovation*. https://doi.org/10.2139/ssrn.1964782

Behrendt, M. (2017). Examination of a Successful and Active Science Club: A Case Study. *Science Educator*, *25*(2), 82–87. https://search-proquest-com.ezproxy.library.uwa.edu.au/docview/1865491597?accountid=14681

Bergen-Cico, D., & Viscomi, J. (2012). Exploring the Association between Campus Co-Curricular Involvement and Academic Achievement. *Journal of College Student Retention: Research, Theory & Practice*, *14*(3), 329–343. https://doi.org/10.2190/CS.14.3.c

Blackburn, H. (2017). The Status of Women in STEM in Higher Education: A Review of the Literature 2007–2017. *Science and Technology Libraries*, *36*(3), 235–273. https://doi.org/10.1080/0194262X.2017.1371658

Blickenstaff, J. C. (2005). Women and science careers: Leaky pipeline or gender filter? *Gender and Education*, *17*(4), 369–386. https://doi.org/10.1080/09540250500145072

Bogdon, Robert; Biklen, S. (2007). *Qualitative research for education: An introduction to theories and methods* (5th ed.). Pearson.

Bolman, L. G., & Deal, T. E. (2013). *Reframing Organizations: Artistry, Choice, and Leadership* (5th ed.). Jossey-Bass.

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

Brinkmann, S., & Kvale, S. (2015). *InterViews : learning the craft of qualitative research interviewing* (3rd ed.). Sage Publications.

Brown, E. R., Belanger, A. L., Clark, E. K., Diekman, A. B., & Steinberg, M. (2016). A Goal Congruity Model of Role Entry, Engagement, and Exit: Understanding Communal Goal Processes in STEM Gender Gaps. *Personality and Social Psychology Review*, *21*(2), 142–175. https://doi.org/10.1177/1088868316642141

Brunsden, V., Davies, M., Shevlin, M., & Bracken, M. (2000). Journal of Further and Higher Education Why do HE Students Drop Out? A test of Tinto's model Why do

HE Students Drop Out? A test of Tinto's model. *Journal of Further and Higher Education*, *24*(3). https://doi.org/10.1080/030987700750022244

Camacho, A. M., & Lapuz, D. R. (2014). The STEM Center: Creating a Model for Success in Community College STEM Education. In *Association for Engineering Education - Engineering Library Division Papers* (pp. 24.1246.1-24.1246.16). American Society for Engineering Education-ASEE. https://www.proquest.com/conference-papers-proceedings/stem-center-creating-model-success-community/docview/2317706943/se-2?accountid=14605

Camacho, D. J., & Legare, J. M. (2016). Shifting gears in the classroom-movement toward personalized learning and competency-based education. *The Journal of Competency-Based Education*, *1*(4), 151–156. https://doi.org/10.1002/cbe2.1032

Cannady, M. A., Greenwald, E., & Harris, K. N. (2014). Problematizing the STEM Pipeline Metaphor: Is the STEM Pipeline Metaphor Serving Our Students and the STEM Workforce? *Science Education*, *98*(3), 443–460. https://doi.org/10.1002/sce.21108

Carlone, H. B., & Johnson, A. (2007). Understanding the Science Experiences of Successful Women of Color: Science Identity as an Analytic Lens. *Journal of Research in Science Teaching*, *44*(8), 1187–1218. https://doi.org/10.1002/tea

Case, K. F. (2011). A gendered perspective on student involvement in collegiate clubs and organizations in christian higher education. *Christian Higher Education*, *10*(3–4), 166–194. https://doi.org/10.1080/15363759.2011.576208

Castellano, M., Ewart Sundell, K., & Richardson, G. B. (2017). Achievement Outcomes Among High School Graduates in College and Career Readiness Programs of Study.

Peabody Journal of Education, *92*(2), 254–274. https://doi.org/10.1080/0161956X.2017.1302220

Castellano, M., Harrison, L., & Schneider, S. (2011). State Secondary Career and Technical Education Standards: Creating a Framework from a Patchwork of Policies. *Career and Technical Education Research*, *33*(1), 25–44. https://doi.org/10.5328/cter33.1.25

Cho, S., Goodman, M., Codling, J., & Robinson, T. (2009). Images of women in STEM fields. *Journal of Science Communication*, *8*(September).

Choi, Y. H. (2022). A Domains of Power Analysis of the Narratives of Women of Color on Community College STEM Education Pathways. *Journal of Women and Gender in Higher Education*, *15*(4), 375–395. https://doi.org/10.1080/26379112.2022.2136676

Cilauro, F. (n.d.). *Using digital skills to take advantage of AI*. Retrieved February 19, 2022, from https://www.frontier-economics.com/uk/en/news-and-articles/articles/article-i7483-using-digital-skills-to-take-advantage-of-ai/

Clark, R., Kaw, A., Lou, Y., Scott, A., & Besterfield-Sacre, M. (2018). Evaluating Blended and Flipped Instruction in Numerical Methods at Multiple Engineering Schools. *International Journal for the Scholarship of Teaching & Learning*, *12*(1), 1–16. https://doi.org/doi.org/10.20429/ijsotl.2018.120111

Creswell, J. W. (2013). *Qualitative inquiry and research design: choosing among five approaches.* Sage Publications.

CTSOS.ORG. (2019). *About: National Coordinating Council for Career and Technical Student Organizations*. Career and Technical Student Organizations.

DeAro, J., Bird, S., & Ryan, S. M. (2019). NSF ADVANCE and gender equity: Past, present and future of systemic institutional transformation strategies. *Equality, Diversity and Inclusion: An International Journal*, *38*(2), 131–139. https://doi.org/https://doi.org/10.1108/EDI-09-2017-0188

Deil-Amen, R. (2011). Socio-Academic Integrative Moments: Rethinking Academic and Social Integration among Two-Year College Students in Career-Related Programs. *The Journal of Higher Education*, *82*(1), 54–91. https://doi.org/10.1080/00221546.2011.11779085

Department of Health, Education, and W. (1979). *The Belmont Report*. https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/read-the-belmont-report/index.html

Diekman, A. B., Brown, E. R., Johnston, A. M., & Clark, E. K. (2010). Seeking Congruity Between Goals and Roles: A New Look at Why Women Opt Out of Science, Technology, Engineering, and Mathematics Careers. *Psychological Science*, *21*(8), 1051–1057. https://doi.org/10.1177/0956797610377342

Dougherty, S. M., & Lombardi, A. R. (2017). From Vocational Education to Career Readiness. *Review of Research in Education*, *40*(1), 326–355. https://doi.org/10.3102/0091732x16678602

Edzie, R. L. (2014). Exploring the Factors that Influence and Motivate Female Students to Enroll and Persist in Collegiate STEM Degree Programs: A Mixed Methods Study. In *ProQuest Dissertations and Theses*.

Ezzy, D. (n.d.). *Qualitative Analysis: Practice and Innovation*. Routledge.

Fain, P. (2018). *Ivy League Degree for the Nontraditional Student*. Inside Higher Ed. https://www.insidehighered.com/digital-learning/article/2018/07/25/penn-announces-online-masters-degree-coursera-platform#.W1z9Q47VVr8.link

Foreman, E. A., & Retallick, M. S. (2013). Using Involvement Theory to Examine the Relationship between Undergraduate Participation in Extracurricular Activities and Leadership Development. *Journal of Leadership Education*, *12*(2), 56–73. https://doi.org/10.12806/v12/i2/56

Goulden, M., Mason, M. A., & Frasch, K. (2011). Keeping Women in the Science Pipeline. *Annals of the American Academy of Political and Social Science*, *638*(1), 141–162. https://doi.org/10.1177/0002716211416925

Griffith, A. L. (2010). Persistence of women and minorities in STEM field majors: Is it the school that matters? *Economics of Education Review*, *29*(6), 911–922. https://doi.org/10.1016/j.econedurev.2010.06.010

Hagedorn, L. S., & Purnamasari, A. V. (2012). A Realistic Look at STEM and the Role of Community Colleges. *Community College Review*, *40*(2), 145–164. https://doi.org/10.1177/0091552112443701

Han, S. W. (2016). National education systems and gender gaps in STEM occupational expectations. *International Journal of Educational Development*, *49*, 175–187. https://doi.org/10.1016/j.ijedudev.2016.03.004

Hand, S., Rice, L., & Greenlee, E. (2017). Exploring teachers' and students' gender role bias and students' confidence in STEM fields. *Social Psychology of Education*, *20*(4), 929–945. https://doi.org/10.1007/s11218-017-9408-8

Herman, C., & Kirkup, G. (2017). Combining feminist pedagogy and transactional distance to create gender-sensitive technology-enhanced learning. *Gender and Education*, *29*(6), 781–795. https://doi.org/10.1080/09540253.2016.1187263

Herrmann, S. D., Adelman, R. M., Bodford, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. Y. (2016). The Effects of a Female Role Model on Academic Performance and Persistence of Women in STEM Courses. *Basic and Applied Social Psychology*, *38*(5), 258–268. https://doi.org/http://dx.doi.org/10.1080/01973533.2016.1209757

Heybach, J., & Pickup, A. (2017). Whose STEM? Disrupting the Gender Crisis Within STEM. *Educational Studies*, *53*(6), 614–627. https://doi.org/10.1080/00131946.2017.1369085

Hoepner, C. (2010). *Advanced Placement math and science courses: Influential factors and predictors for success in college STEM majors*. University of California Los Angeles.

Hoffman, E., Starobin, S. S., Laanan, F. S., & Rivera, M. (2010). Role of Community Colleges in Stem Education: Thoughts on Implications for Policy, Practice, and Future Research. *Journal of Women and Minorities in Science and Engineering*, *16*(1), 85–96. https://doi.org/10.1615/jwomenminorscieneng.v16.i1.60

Hu, X., & Ortagus, J. C. (2019). A National Study of the Influence of the Community College Pathway on Female Students' STEM Baccalaureate Success. *Community College Review*, *47*(3), 242–273. https://doi.org/10.1177/0091552119850321

Improving Career and Technical Education to Help Students Suceed in the Workforce (2015).

Ireland, D. T., Freeman, K. E., Winston-Proctor, C. E., DeLaine, K. D., McDonald Lowe, S., & Woodson, K. M. (2018). (Un)Hidden Figures: A Synthesis of Research Examining the Intersectional Experiences of Black Women and Girls in STEM Education. *Review of Research in Education*, *42*(1), 226–254. https://doi.org/10.3102/0091732X18759072

Jackson, D. L., & Laanan, F. S. (2011). The role of community colleges in educating women in science and engineering. *New Directions for Institutional Research*, *2011*(152), 39–49. https://doi.org/10.1002/ir.407

James, S. M., & Singer, S. R. (2016). From the NSF: The national science foundation's investments in broadening participation in science, technology, engineering, and mathematics education through research and capacity building. *CBE Life Sciences Education*, *15*(3), 1–8. https://doi.org/10.1187/cbe.16-01-0059

Karp, M. M., Hughes, K. L., & O'gara, L. (2008). *An Exploration of Tinto's Integration Framework for Community College Students*.

Labov, J. B. (2012). Changing and evolving relationships between two- and four-year colleges and universities: they're not your parents' community colleges anymore. *CBE Life Sciences Education*, *11*(2), 121–128. https://doi.org/10.1187/cbe.12-03-0031

Lakes, R. D. (2007). *Four Key Themes in Perkins III Reauthorization: A Political Analysis Richard D. Lakes Georgia State University*. *23*(1), 109–120.

Langdon, D., Beede, D., & Doms, M. (2011). STEM: Good jobs now and for the future (Report No. 03-11). *Economics and Statistics Administration Issue Brief*, *03*(11), 1–10. https://doi.org/10.1212/WNL.35.11.1657

Lapan, S. D., Quartaroli, M. T., & Frances, J. R. (2012). *Qualitative research : an introduction to methods and designs*. Jossey-Bass.

Le, H., & Robbins, S. B. (2016). Building the STEM pipeline: Findings of a 9-year longitudinal research project. *Journal of Vocational Behavior*, *95–96*, 21–30. https://doi.org/10.1016/j.jvb.2016.07.002

Leavey, N. (2016). *Mentoring Women in STEM: A Collegiate Investigation of Mentors and Proteges* [Stony Brook University]. https://doi.org/10.1007/s00464-003-8282-y

Lee, J. (2008). *Gender Equity Issues in Technology Education: A Qualitative Approach to Uncovering the Barriers*.

Lehman, K. J., Sax, L. J., & Zimmerman, H. B. (2017). Women planning to major in computer science: Who are they and what makes them unique? *Computer Science Education*, *26*(4), 277–298. https://doi.org/10.1080/08993408.2016.1271536

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

Lyon, L. A. (2013). *Sociocultural Influences on Undergraduate Women's Entry into a Computer Science Major*. University of Washington.

Maldonado, L. G., & Jaeger, A. J. (2021). Exploring Participation in SkillsUSA Among Postsecondary Students. *Career and Technical Education Research*, *45*(3), 21–44. https://doi.org/10.5328/cter45.3.21

Maltby, J. L., Brooks, C., Horton, M., & Morgan, H. (2016). Long Term Benefits for Women in a Science, Technology, Engineering, and Mathematics Living-Learning Community. *Learning Communities Research and Practice*, *4*(1), 5–24. http://washingtoncenter.evergreen.edu/lcrpjournal/vol4/iss1/2

Maltese, A. V., & Tai, R. H. (2011). Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among U.S. students. *Science Education*, *95*(5), 877–907. https://doi.org/10.1002/sce.20441

Marksbury, N. (2017). *Forum on Public Policy: Monitoring the Pipeline: STEM Education in Rural U.S.* https://www.congress.gov/bill/114th-

McFarland, J., Leoni, D., Fleming, M. T., & Goodman, N. (2018). Increasing Community College STEM Student Success and Persistence through Engaged Communities of Support. *The FASEB Journal*, *32*(S1), 629.1-629.1. https://doi.org/https://doi.org/10.1096/fasebj.2018.32.1_supplement.629.1

McGee, E. O., & Bentley, L. (2017). The Troubled Success of Black Women in STEM. *Cognition and Instruction*, *35*(4), 265–289. https://doi.org/10.1080/07370008.2017.1355211

Merriam, S. B. (2009). *Qualitative Research: A Guide to Design and Implementation* (2nd ed.). Jossey-Bass.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative Research : A Guide to Design and Implementation, 4th Edition*.

Mertens, D. M. (2015). *Research and Evaluation in Education and Pyschology* (4th ed.). SAGE.

Miller, D. I., & Wai, J. (2015). The bachelor's to Ph.D. STEM pipeline no longer leaks more women than men: A 30-year analysis. *Frontiers in Psychology*, *6*(FEB), 1–10. https://doi.org/10.3389/fpsyg.2015.00037

Mooney, G. M., & Foley, D. J. (2011). *Community Colleges: Playing an Important Role in the Education of Science, Engineering, and Health Graduates*.

https://wayback.archive-it.org/5902/20150628150455/http://www.nsf.gov/statistics/infbrief/nsf11317/nsf11317.pdf

Mullet, D. R., Rinn, A. N., & Kettler, T. (2017). Catalysts of women's talent development in STEM: A Systematic Review. *Journal of Advanced Academics*, *28*(4), 253–289. https://doi.org/10.1177/1932202X17735305

National Science Foundation. (n.d.). *National Survey of Recent College Graduates Survey Year 2010*. Retrieved March 31, 2019, from https://ncsesdata.nsf.gov/recentgrads/2010/

North Carolina School Counselor Association - Regions. (n.d.). Retrieved April 3, 2022, from https://ncschoolcounselor.org/page-1535569?emulatemode=2

Othman Aljohani. (2016). A Comprehensive Review of the Major Studies and Theoretical Models of Student Retention in Higher Education. *Higher Education Studies*, *6*(2).

Packard, B. W.-L., & Jeffers, K. C. (2013). Advising and Progress in the Community College STEM Transfer Pathway. *NACADA Journal*, *33*(2), 65–76. https://doi.org/10.12930/NACADA-13-015

Perkins V (2018). https://cte.careertech.org/sites/default/files/PerkinsV_September2018.pdf

Ravitch, Sharon M.; Carl, N. M. (2016). *Qualitative Research*. SAGE.

Reese, S. (2003). Career and technical student organizations: Building Our Future. *Connecting Education and Careers*, *78*(2), 18–23.

Reese, S. (2010). Learning and Serving through CTE.pdf. *Connecting Education and Careers*, *85*(4), 16–20.

Rodriguez, S. L., Cunningham, K., & Jordan, A. (2017). What a Scientist Looks Like: How Community Colleges Can Utilize and Enhance Science Identity Development as a Means to Improve Success for Women of Color. *Community College Journal of Research and Practice*, *41*(4–5), 232–238. https://doi.org/10.1080/10668926.2016.1251354

Sarseke, G. (2018). Under-Representation of Women in Science: From Educational, Feminist and Scientific Views. *NASPA Journal About Women in Higher Education*, *11*(1), 89–101. https://doi.org/10.1080/19407882.2017.1380049

Savaria, M., & Monteiro, K. (2017). A critical discourse analysis of engineering course syllabi and recommendations for increasing engagement among women in STEM. *Journal of STEM Education: Innovations and Research*, *18*(1), 92–97. http://www.jstem.org/index.php?journal=JSTEM&page=article&op=view&path%5B%5D=2217

Schultz, L. H., Connolly, J. J., Garrison, S. M., Leveille, M. M., & Jackson, J. J. (2017). Vocational interests across 20 years of adulthood: Stability, change, and the role of work experiences. *Journal of Research in Personality*, *71*, 46–56. https://doi.org/10.1016/j.jrp.2017.08.010

SkillsUSA Championships (Career Competition Events) - SkillsUSA.org. (n.d.). Retrieved March 20, 2022, from https://www.skillsusa.org/competitions/skillsusa-championships/

SkillsUSA.org. (n.d.). Retrieved March 20, 2022, from https://www.skillsusa.org/

Stanislawski, D., & Haltinner, U. (2008). Model for Preparing Marketing and Business Teachers to Meet the Challenge of CTSO Leadership and Advisement. *Delta Pi Epsilon Journal*, *51*(3), 166–176. http://eric.ed.gov/?id=EJ880549

Su, X., Johnson, J., & Bozeman, B. (2015). Gender diversity strategy in academic departments: exploring organizational determinants. *Higher Education*, *69*(5), 839–858. https://doi.org/10.1007/s10734-014-9808-z

Thackeray, S. (2016). Overcoming the Toxi Influence of Subtle Messaging: Utah Women who Persist in STEM. In *Mmum* (Issue December). Northeastern University.

Threeton, M. D. (2006). Car D. Perkins Voc Ed to CTE. *Journal of Industrial Teacher Education*, *44*(1), 66–82.

Threeton, M. D., & Pellock, C. (2016). An Examination of the Relationship Between SkillsUSA Student Contest Preparation and Academics. *Journal of Career and Technical Education*, *25*(2), 94–108. https://doi.org/10.21061/jcte.v25i2.481

Tinto, V. (1975). *Dropout from Higher Education: A Theoretical Synthesis of Recent Research*. *5*(1), 8–9.

Tinto, V. (1990). Principles of Effective Retention. *Journal of The First-Year Experience & Students in Transition*, *1*, 35–48.

Tinto, V. (1993). *Leaving College: Rethinking the causes and cures of student attrition*. The University of Chicago Press.

Tinto, V. (2006). Research and Practice of Student Retention: What Next? *Journal of College Student Retention: Research, Theory & Practice*, *8*(1), 1–19.

Tinto, V. (2017). Through the Eyes of Students. *Journal of College Student Retention: Research, Theory and Practice*, *19*(3), 254–269. https://doi.org/10.1177/1521025115621917

Tinto, Vincent. (2012). *Completing college : rethinking institutional action*. Univ. of Chicago Press.

Toglia, T. (2013). Gender Equity Issues in CTE and STEM Education. *Tech Directions*, *february*, 14–17.

Tracey, T. J. G., Robbins, S. B., & Hofsess, C. D. (2005). Stability and change in interests: A longitudinal study of adolescents from grades 8 through 12. *Journal of Vocational Behavior*, *66*(1), 1–25. https://doi.org/10.1016/j.jvb.2003.11.002

Wang, M. te, & Degol, J. L. (2017). Gender Gap in Science, Technology, Engineering, and Mathematics (STEM): Current Knowledge, Implications for Practice, Policy, and Future Directions. *Educational Psychology Review*, *29*(1), 119–140. https://doi.org/10.1007/s10648-015-9355-x

Wessel, R. D., Christian, N. T., & Hoff, A. K. (2003). *Enhancing Career Development Through the Career Success Club*. *29*(4), 265–277.

White House. (2011). *The White House Summit on Community Colleges*. https://obamawhitehouse.archives.gov/sites/default/files/uploads/community_college_summit_report.pdf

Wickersham, K., & Wang, X. (2016). What's Life Got to Do With It? The Role of Life Experiences in Shaping Female Community College Students' Transfer Intent in STEM Fields of Study. *Community College Journal of Research and Practice*, *40*(12), 1001–1012. https://doi.org/10.1080/10668926.2016.1211039

Wilson-Kennedy, Z., Byrd, G. S., Kennedy, E., & Frierson, H. T. (2019). *Broadening Participation in STEM : Effective Methods, Practices, and Programs*. Emerald Publishing Limited. http://ebookcentral.proquest.com/lib/uncc-ebooks/detail.action?docID=5710400

Xu, Y. J. (2017). Attrition of Women in STEM: Examining Job/Major Congruence in the Career Choices of College Graduates. *Journal of Career Development*, *44*(1), 3–19. https://doi.org/10.1177/0894845316633787

Xu, Y. J., & Webber, K. L. (2018). College Student Retention on a Racially Diverse Campus: A Theoretically Guided Reality Check. *Journal of College Student Retention: Research, Theory and Practice*, *20*(1), 2–28. https://doi.org/10.1177/1521025116643325

APPENDIX A: INFORMED CONSENT FORM (INTERVIEW)

UNIVERSITY OF NORTH CAROLINA
CHARLOTTE
Department of Educational Leadership
9201 University City Boulevard, Charlotte, NC 28223-0001

Consent to be Part of a Research Study

Title of the Project: Exploring the Role of Student Organizations in the Persistence of Women in STEM Associate Degree Programs
Principal Investigator: Zack Hubbard, Doctoral Candidate, University of North Carolina Charlotte
Faculty Advisor: Dr. Ayesha Sadaf, Professor – Educational Leadership, University of North Carolina Charlotte

You are invited to participate in a research study. Participation in this research study is voluntary. The information provided is to help you decide whether or not to participate. If you have any questions, please ask.

Important Information You Need to Know

- The purpose of this study is to explore the influence of on-campus STEM related student organizations on the persistence of women in STEM programs, and capture the perceptions of women who participate in a student organization intended to support the retention and success of women pursuing a STEM related degree at the community college level.
- You will be asked to participate in an interview (in-person or phone).
- You will also be asked to participate in an optional focus group at a later date. There will be a separate consent form for the focus group, should you choose to participate.
- If you choose to participate it will require one hour of your time.
- Risks or discomforts from this research include associated emotional distress from answering questions about your undergraduate STEM experience.
- No benefits to participants

Please read this form and ask any questions you may have before you decide whether to participate in this research study.

Why are we doing this study?
This study will explore the influence of an on-campus STEM related student organization on the retention of women in STEM related Associate in Applied Science degree programs at public two-year community colleges in central North Carolina. A qualitative case study approach will be used to complete this study. This approach was chosen to capture in-depth descriptions of participation in a student organization whose mission is to support students in engineering and industrial technologies and how participation may relate to their retention in STEM programs. The lack of existing knowledge around the role of student support organizations at the two-year level is an obvious gap in the literature that will be explored further in this study. Results from

this study can be used to better understand the impact of support organizations for women in STEM and how they may be used to influence the retention of those students.

Why are you being asked to be in this research study.

This study is designed to interview women in a STEM related major at a community college who participate in the SkillsUSA student organization. You are being asked to be in this study because you have a history of participation in a student club or organization that was designed to support you during your educational career at a community college. The participants of this study will meet the following criteria:

1. Will be individuals who identify as women who are at least 18 years old.
2. Will be enrolled in an engineering or industrial technology focused AAS or AE degree at any NC Community College
3. Has participated in a chapter of the SkillsUSA student organization for at least one full 16-week semester.

What will happen if I take part in this study?

If you choose to participate in this study, you will be asked to provide a description of your involvement with the student organization and its impact on your academic career. This interview can be conducted in person or via phone. The interview will be recorded (audio only).

You time commitment will be about one hour to complete the interview.

The transcript from the audio-recorded interview session will be used to provide data for this study.

What are the benefits of this study?

You will not benefit directly from being in this study. However, others might benefit because the study will provide information to institutions about what aspects of your experience with a student club or organization was beneficial to your career.

What risks might I experience?

The only risks associated with this study would relate to experiencing stress or fatigue in completing the focus group session. To help minimize this risk, you are able to skip any item or withdraw from the study at any time without negative implications.

How will my information be protected?

We plan to publish the results of this study. To protect your privacy, we will not include any information that could identify you. We will protect the confidentiality of the research data by not storing or requesting personally identifiable information other than the consent forms

Other people may need to see the information we collect about you. Including people who work for UNC Charlotte, and other agencies as required by law or allowed by federal regulations.

How will my information be used after the study is over?

After this study is complete, identifiers will be removed from the data and the data could be used for future research studies or distributed to another investigator for future research studies without additional informed consent.

After this study is complete, study data may be shared with other researchers for use in other studies without asking for your consent again or as may be needed as part of publishing our results. The data we share will NOT include information that could identify you.

What are my rights if I take part in this study?
It is up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you chose to not complete the interview all data relating to you will be destroyed.

Who can answer my questions about this study and my rights as a participant?
For questions about this research, you may contact the principal investigator, Zack Hubbard by emailing zhubbar1@uncc.edu. Additionally, you may direct questions at the faculty advisor, Ayesha Sadaf by emailing asadaf@uncc.edu.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Office of Research Protections and Integrity at uncc-irb@uncc.edu.

Consent to Participate
By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will receive a copy of this document for your records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about, and my questions so far have been answered. I agree to take part in this study.

Consent to be audio recorded
To assist with accurate recording of participant responses, interviews may be audio recorded names and identifying information will not be utilized during the recording.

Participants have the right to refuse to allow such recording without penalty. Please select one of the following options:

_____I consent to the use of audio recording.
_____I do not consent to the use of audio recording.

_____
Name (PRINT)

_____
Signature Date

_____
Name and Signature of person obtaining consent Date

APPENDIX B: INFORMED CONSENT FORM (FOCUS GROUP)

UNIVERSITY OF NORTH CAROLINA
CHARLOTTE

Department of Educational Leadership
9201 University City Boulevard, Charlotte, NC 28223-0001

Consent to be Part of a Research Study

Title of the Project: Exploring the Role of Student Organizations in the Persistence of Women in STEM Associate Degree Programs
Principal Investigator: Zack Hubbard, Doctoral Candidate, University of North Carolina Charlotte
Faculty Advisor: Dr. Ayesha Sadaf, Professor – Educational Leadership, University of North Carolina Charlotte

You are invited to participate in a research study. Participation in this research study is voluntary. The information provided is to help you decide whether or not to participate. If you have any questions, please ask.

Important Information You Need to Know

- The purpose of this study is to explore the influence of on-campus STEM related student organizations on the persistence of women in STEM programs, and capture the perceptions of women who participate in a student organization intended to support the retention and success of women pursuing a STEM related degree at the community college level.
- You will be asked to participate in a focus group discussion (in-person).
- If you choose to participate it will require one hour of your time.
- Risks or discomforts from this research include associated emotional distress from answering questions about your undergraduate STEM experience.
- No benefits to participants

Please read this form and ask any questions you may have before you decide whether to participate in this research study.

Why are we doing this study?
This study will explore the influence of an on-campus STEM related student organization on the retention of women in STEM related Associate in Applied Science degree programs at public two-year community colleges in central North Carolina. A qualitative case study approach will be used to complete this study. This approach was chosen to capture in-depth descriptions of participation in a student organization whose mission is to support students in engineering and industrial technologies and how participation may relate to their retention in STEM programs. The lack of existing knowledge around the role of student support organizations at the two-year level is an obvious gap in the literature that will be explored further in this study. Results from this study can be used to better understand the impact of support organizations for women in STEM and how they may be used to influence the retention of those students.

Why are you being asked to be in this research study.
This study is designed to interview women in a STEM related major at a community college who participate in the SkillsUSA student organization. You are being asked to be in this study because you have a history of participation in a student club or organization that was designed to support you during your educational career at a community college. The participants of this study will meet the following criteria:
1. Will be individuals who identify as women who are at least 18 years old.
2. Will be enrolled in an engineering or industrial technology focused AAS or AE degree at any NC Community College
3. Has participated in a chapter of the SkillsUSA student organization for at least one full 16-week semester.

What will happen if I take part in this study?
If you choose to participate in this study, you will be asked to provide a description of your involvement with the student organization and its impact on your academic career. This focus group discussion will be conducted at the SkillsUSA regional conference and will be audio recorded.

You time commitment will be about one hour to complete the focus group discussion.

The transcript from the audio-recorded focus group discussion will be used to provide data for this study.

What are the benefits of this study?
You will not benefit directly from being in this study. However, others might benefit because the study will provide information to institutions about what aspects of your experience with a student club or organization was beneficial to your career.

What risks might I experience?
The only risks associated with this study would relate to experiencing stress or fatigue in completing the focus group session. To help minimize this risk, you are able to skip any item or withdraw from the study at any time without negative implications.

How will my information be protected?
We plan to publish the results of this study. To protect your privacy, we will not include any information that could identify you. We will protect the confidentiality of the research data by not storing or requesting personally identifiable information other than the consent forms

Other people may need to see the information we collect about you. Including people who work for UNC Charlotte, and other agencies as required by law or allowed by federal regulations.

How will my information be used after the study is over?

After this study is complete, identifiers will be removed from the data and the data could be used for future research studies or distributed to another investigator for future research studies without additional informed consent.

After this study is complete, study data may be shared with other researchers for use in other studies without asking for your consent again or as may be needed as part of publishing our results. The data we share will NOT include information that could identify you.

What are my rights if I take part in this study?
It is up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you chose to not complete the interview all data relating to you will be destroyed.

Who can answer my questions about this study and my rights as a participant?
For questions about this research, you may contact the principal investigator, Zack Hubbard by emailing zhubbar1@uncc.edu. Additionally, you may direct questions at the faculty advisor, Ayesha Sadaf by emailing asadaf@uncc.edu.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Office of Research Protections and Integrity at uncc-irb@uncc.edu.

Consent to Participate
By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will receive a copy of this document for your records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about, and my questions so far have been answered. I agree to take part in this study.

Consent to be audio recorded
To assist with accurate recording of participant responses, interviews may be audio recorded names and identifying information will not be utilized during the recording.

Participants have the right to refuse to allow such recording without penalty. Please select one of the following options:

_____I consent to the use of audio recording.
_____I do not consent to the use of audio recording.

_____
Name (PRINT)

_____
Signature Date

_____
Name and Signature of person obtaining consent Date

APPENDIX C: INTERVIEW GUIDE

Exploring the Role of Student Organizations in the Persistence of Women in STEM Associate Degree Programs

Interview Questions:

This study will explore the influence of an on-campus STEM related student organization on the retention of women in STEM related Associate in Applied Science degree programs at public two-year community colleges in central North Carolina. An exploratory qualitative case study approach will be used to complete this study.

The following research questions will guide this study:

1. What aspects of participation in SkillsUSA are the most impactful for women in STEM?
2. How do women in STEM perceive the role of SkillsUSA in their persistence in STEM programs?
3. What are the experiences of women who participate in SkillsUSA in relation to their persistence in STEM Programs?

Establishing Rapport/Background:

1. Tell me a bit about your interests in the areas of science, technology, engineering, or Math.
2. Did you explore any of those in an extra-curricular setting in the past (or college career in general)?
3. What community college do you attend?
4. What was/is your major?
5. What kind of career goals do you have?
6. What is your best memory from your time in college so far?
7. During your time at [School Name], what extracurricular activities did you participate in?

What types of extracurricular activities did the student participate in?

8. What made you want to participate in those activities?
9. Describe your experience with this club/organization?
10. What are your biggest takeaways from your participation?

What impact did the student club/organization have on the student?

11. What made you want to participate in those activities?
12. How do you feel the participation in the club has impacted your academic career?
13. Do you know the club advisor (faculty member) very well?
14. How do you feel that your relationship with the faculty advisor has impacted you personally and your academic career?
15. How has the student organization contributed to you continuing to pursue your degree? Have there been any challenges where you almost considered stopping?

Social Implications

16. What was the most meaningful relationship you developed from participating in the club?
17. Tell me about your favorite campus activities on campus?
18. Tell me about the people that you met through the club?
19. Would you like to stay in touch with many of the people you met through the club?
20. How do women in STEM perceive the role of the student organization in their persistence?
21. Is there anything that you would like to share with me about the club that we haven't already discussed?

APPENDIX D: FOCUS GROUP DISCUSSION GUIDE

Read full description of Project to group:

Title: The Role of Student Organizations in the persistence of Women in STEM Associate Degree Programs

Purpose: The purpose of this qualitative case study is to explore the influence of on-campus STEM related student organizations on the retention of women in STEM programs and capture the perceptions of women who participate in a student organization intended to support the retention and success of women pursuing a STEM related degree at the community college level.

Discussion Topics:

1. What are your experiences in SkillsUSA?
2. Has SkillsUSA played in your college career? If so, how?
3. Has SkillsUSA impacted your choice of major in college? If so, how?
4. Has SkillsUSA impacted your desire to stay in school? If so, how?
5. Do you have any other comments related to your participation in the SkillsUSA and how it influenced your career in STEM?

APPENDIX E: OBSERVATION PROTOCOL

Researcher Name:	
Date/Time:	
Setting Description:	
Description of Topics / Agenda of Event	

Notes:

Themes	Comments/Feedback/Notes
Role of Competition	
Impact on College Goals / Plans	
Impact on Career Goals / Plans	
Support of Faculty / Advisor	
Mention of Retention / Persistence	
Relationships with Peers / Peer Support System	