Exploring Transfer Students’ Perceptions of Their Transition Experience in Calculus 2 at a Research Intensive Institution: A Schlossberg’s and Tinto’s Theory Approach

Steven Edalgo
sedalgo@g.clemson.edu

Follow this and additional works at: https://tigerprints.clemson.edu/all_dissertations

Recommended Citation
Edalgo, Steven, "Exploring Transfer Students’ Perceptions of Their Transition Experience in Calculus 2 at a Research Intensive Institution: A Schlossberg’s and Tinto’s Theory Approach" (2023). All Dissertations. 3396.
https://tigerprints.clemson.edu/all_dissertations/3396

This Dissertation is brought to you for free and open access by the Dissertations at TigerPrints. It has been accepted for inclusion in All Dissertations by an authorized administrator of TigerPrints. For more information, please contact kokeefe@clemson.edu.
EXPLORING TRANSFER STUDENTS’ PERCEPTIONS OF THEIR TRANSITION EXPERIENCE IN CALCULUS 2 AT A RESEARCH INTENSIVE INSTITUTION: A SCHLOSSBERG’S AND TINTO’S THEORY APPROACH

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Engineering and Science Education

by
Steven Taylor Edalgo
August 2023

Accepted by:
Dr. Karen High, Committee Chair
Dr. Matthew Boyer
Dr. Matthew Voigt
Dr. Bridget Trogden
Abstract

This study explored the lived experiences of eleven transfer students as they described their experiences in Calculus 2 at very high research land grant institutions (R1). This qualitative investigation focused on the psychological phenomenon of transition as the transfer students perceived, reflected, made sense, and understood their transition experience. Furthermore, this study explored transfer students’ understanding of how they perceive the attributes of their success or lack of success in Calculus 2.

Employing the use of Schlossberg’s Transition Framework along with Tinto’s Persistence/Departure Framework, the perceptions of the transition experience was analyzed through the lens of this conceptual framework. The experiences of eleven transfer students, Amanda, Andrew, Brandon, Brian, Claire, Jake, James, Joshua, Kay, Lauren, and Mary, who lived and are living the transition experience in Calculus 2 are described in this dissertation work. Their rich descriptions provide an understanding into the experiences transfer students encounter in Calculus 2 at a R1 institution. They emphasized their successes and challenges with their transition and described their feelings while enrolled in Calculus 2 and their reflections after completing Calculus 2 at the R1.

This work highlights four emergent themes viewed through the lens of a conceptual framework that describes the perceptions and reflections of the transition process. This study finds transfer students describe challenges and optimism facing Calculus 2. The emergent themes reveal feelings of being unprepared for Calculus 2 at the R1, understanding the crucial need for support during Calculus 2, recognizing perseverance matters during Calculus 2 and taking individual responsibility as they describe determination and motivation for understanding content in Calculus
2 as transfer students at the R1 institution. Through the interpretations, the reader of this work will gain further insight into descriptions of the emergent themes and lives of the transfer students from this study.

Their experiences truly illustrate the need for improving how mathematics instructors and departments at R1 institutions approach incoming transfer students from non-R1 institutions enrolled in Calculus 2. By presenting the transfer students perceptions and my interpretations, the findings reveal transfer students internalized their own responsibility and transfer status for their success in Calculus 2, recognize a shift in support systems at the R1 institution, and describe a high motivation for understanding the content in Calculus 2.
Dedication

To my Wife, Yen, who has sacrificed so much for me to pursue my academic interests. Constantly providing emotional support in her selfless actions, my life would not be as it is if it were not for Yen. I am forever grateful for the countless conversations, encouragement to pursue Ph.D., unconditional love, and of course, our many moments enjoying coffee together. I cannot express enough gratitude for your unfailing support and kindness. Thank you for being there in moments of despair and ambiguity.

To my mother, Jenny, who constantly encouraged my academic endeavors and continuation into my interests. Although, she did not make it through my Ph.D. pursuit, her presence is always felt when I need comfort and encouragement, especially when I am feeling self-doubt and despair. I cannot express my infinite gratitude for your love and support. I would not be who I am today without your guidance and strength through my life. I hope that my pursuits make you proud, mom.

To my best friend, Baymax the Golden, who has his own unique language and ways of communication usually in the form of a bark. You have provided many days of companionship and support that you are not even aware of. Many days have I spent talking with you about my mental state and you lifted me back up.
Acknowledgements

My utmost and heartfelt thanks go to the participants of this study. I will forever be grateful for and appreciative for the experiences you shared and showing your vulnerabilities and your ability to share your thoughts and reflections with me. I cannot express how thankful I am for your time.

I am so thankful to the undergraduate intern students that helped with the data collection, data analysis, quality, and interpretations for the results. Emma, Cate, and Ali, I would not be at this stage without your help, and I am forever grateful for your conversations and wise interpretations.

Thank you to my advisor, Dr. Karen High, for your encouragement, opportunities, patience, kindness, and constant reminder I am on the right track and making progress. Thank you for giving me the opportunities of working on research projects and finding funding, when I was approaching moments of despair, your actions and words lifted me back to a space mentally where I felt I could carry on with my research and studies. Thank you for guiding me through this journey and reassuring me things are fine even on my toughest days.

I would love to extend my gratitude for my awesome committee members, Dr. Matthew Boyer, Dr. Matt Voigt, and Dr. Bridget Trogden. Your guidance, feedback and conversations dismantled my moments of despair and provided clarity for my progress. Matthew, our conversations about qualitative research and philosophical perspectives helped me grow immeasurably as an early career qualitative researcher. Matt, our conversations always left me thinking and I felt like I learned more about my research by thinking of just a phrase or word that you mentioned during our talks. Your guidance helped me craft my research questions, interview protocol, and think about my results as answers for the research questions. Bridget, your class
grounded and humbled my approach to students, and I am extremely grateful for the opportunity you gave me to explore a self-study of a R1 institution. This self-study allowed me to grow in the field of diversity, equity and inclusion and I am thankful for working with the office of Undergraduate Studies. Thank you all for your help and guidance!

I would like to thank Dr. Gary Lichtenstein for your guidance in mixed methods research and understanding the importance of applying conceptual frameworks. Your mentorship helped mold and developed my skills as a qualitative researcher and thinking about crafting conceptual frameworks. Our numerous meeting and discussions were always fruitful and filled with optimism, even during moments when I felt confused or unproductive. Thank you for never criticizing my shortcomings but encouraging me to embark on ideas and approaches I had to qualitative research.

Thank you to my ESED staff, faculty, and friends for your immeasurable encouragement and acceptance, and your ability to make one feel as part of a caring family. I would not be at the level I am at today without ESED and I am forever humble and grateful for my opportunity to belong to such a wonderful and supporting department. I wish other departments would share the sentiments that ESED models itself on. Thank you to Dr. Cindy Lee, you’re caring, and kind nature always lifts me up when conversating with you and I cannot express how much I learned from you while working on collaborative research with you and others. Thank you to Dr. Eliza Gallagher for introducing me to research methods in mathematics education and helping my understanding of theoretical perspectives and frameworks. Your course certainly impacted my development as a mathematics education researcher. Thank you especially to my research group, the KAH Group, your feedback and discussions helped my growth and development as a researcher, teacher, and overall human being. I’d also like to thank Abby, Tony, Paran, Shannon, and Haleh for your encouragement and conversations during our Ph.D. journeys.
Lastly, I would like to thank my family for their unfailing support during my academic pursuits. Especially, my grandmother, for your comforting and uplifting conversations and reminding me of my faith, for which you had a contributing influence.

I know there are others I am missing in these acknowledgements, so I would like to extend my gratitude and appreciation for all others that had a significant impact on my development as a researcher, mathematics educator, and scholar that can only hope to contribute to the mathematics community.
TABLE OF CONTENTS

Abstract ........................................................................................................................................... 2
Dedication .......................................................................................................................................... 4
Acknowledgements .......................................................................................................................... 5
TABLE OF CONTENTS ..................................................................................................................... 8
LIST OF TABLES ............................................................................................................................. 11
LIST OF FIGURES .......................................................................................................................... 12
Chapter 1 .......................................................................................................................................... 13
  1.1 Purpose and Research Questions .............................................................................................. 16
     Purpose ......................................................................................................................................... 16
     Research Questions ..................................................................................................................... 17
  1.2 Brief Overview of the Study ....................................................................................................... 17
  1.3 Researcher Positionality ............................................................................................................ 18
  1.4 Definitions of Terms .................................................................................................................. 20
  1.5 Conclusion .................................................................................................................................. 22
Chapter 2 .......................................................................................................................................... 23
Literature Review ............................................................................................................................. 23
  2.1 Brief History of Calculus Literature ......................................................................................... 23
  2.2 The Calculus 2 Literature ......................................................................................................... 25
  2.3 Community College Transfer Students .................................................................................... 26
  2.4 Literature Gap: Transfer Students in Calculus 2 ..................................................................... 29
Chapter 3 .......................................................................................................................................... 31
Conceptual Framework .................................................................................................................... 31
  3.1 Schlossberg’s Transition Framework ......................................................................................... 32
  3.2 Tinto’s Persistence/Departure Framework ............................................................................... 35
  3.3 Conceptual Framework ............................................................................................................. 36
  3.4 Pilot Study .................................................................................................................................. 38
     Data Collection ............................................................................................................................. 39
     Data Analysis ............................................................................................................................... 42
     Pilot Study Results ........................................................................................................................ 42
     Conclusion ..................................................................................................................................... 44
Chapter 4 .......................................................................................................................................... 45
Theoretical Perspective & Educational Paradigm ............................................................................... 45
4.1 Philosophical Perspectives ................................................................. 45
    Epistemological Stance .................................................................... 45
    Ontological Stance .......................................................................... 46

4.2 Theoretical Perspective ................................................................. 47

4.3 Educational Paradigm ................................................................. 48

Chapter 5 ........................................................................................... 50

Research Methods ................................................................................. 50

5.1 Institutional Review Board and Approval .......................................... 50

5.2 Methodology Justification .............................................................. 50

5.3 Introduction to Phenomenological Methods ...................................... 53
    Epoch - Bracketing .......................................................................... 53
    Psychological Phenomenology ......................................................... 54

5.4 Sampling – Participant Selection .................................................... 55
    Participants ...................................................................................... 58
    Participant Summary ...................................................................... 65

5.5 Data Collection – Semi-Structured Interviews ................................... 67
    Interview Protocol .......................................................................... 68

5.6 Analysis ........................................................................................ 71
    Transcript Organization .................................................................. 72
    Coding Team ................................................................................ 74
    First Cycle Coding ......................................................................... 75
    Second Cycle Coding .................................................................. 77

5.7 Validity & Reliability .................................................................... 79
    Theoretical Validation .................................................................... 81
    Procedural Validity ......................................................................... 81
    Communicative Validity .................................................................. 82
    Pragmatic Validity ......................................................................... 82
    Ethical Validity ............................................................................... 83
    Process Reliability ......................................................................... 83

5.8 Conclusion .................................................................................... 84

Chapter 6 .......................................................................................... 85

Results & Findings ............................................................................... 85

    Results – Emergent Themes .......................................................... 86

6.1 Theme 1 – Feels Unprepared for Calculus 2 .................................... 86

6.2 Theme 2 – Support is Necessary for Persistence ................................ 92

6.3 Theme 3 – Perseverance Matters .................................................... 101

6.4 Theme 4 – Takes Individual Responsibility ...................................... 106

6.5 Aligning Results with Theory ....................................................... 110

6.6 Addressing the Research Questions ............................................... 113

6.7 Interpretive Findings .................................................................... 116
LIST OF TABLES

Table                                               Page

Table 1 - Educational Paradigm............................................................................................................. 48

Table 2 - Phenomenology, Phenomenography, & Grounded Theory Qualitative Methodologies
........................................................................................................................................................................ 51

Table 3 - Original Criteria for Sampling.................................................................................................. 56

Table 4 - Final Criteria for Sampling.......................................................................................................... 57

Table 5 – Intended Data Collection Aligned with Research Questions...................................................... 66

Table 6 - Interview Protocol Aligned with Conceptual Framework & Intention ..................................... 69

Table 7 - A priori & Emergent Codes Aligned with Conceptual Framework ............................................. 76

Table 8 - Q3 Framework for Quality in Qualitative Research................................................................. 80

Table 9 - Participant Information................................................................................................................ 86

Table 10 - Emergent Themes Aligned with Conceptual Framework......................................................... 111
<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Degree Seeking Transfer Students</td>
<td>14</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Schlossberg's Transition Framework</td>
<td>33</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Tinto's Persistence/Departure Framework</td>
<td>36</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Conceptual Framework</td>
<td>37</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Psychological Phenomenology Research Design</td>
<td>55</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Example Data Organization Q1 Excerpt</td>
<td>74</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Sample Excerpt with A priori Codes</td>
<td>76</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Emergent Theme Concept Map Depiction</td>
<td>78</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Quality Management Model of Research Process</td>
<td>79</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Themes Aligned with Conceptual Framework</td>
<td>113</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Themes Aligned with Research Questions</td>
<td>116</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Revised Conceptual Framework</td>
<td>123</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction

Since the beginning of President Obama’s Educate to Innovate Campaign to increase the number of STEM (Science, Technology, Engineering, Mathematics) graduates in the United States more students are pursuing STEM degrees each year (PCAST, 2012). The President’s Council of Advisors on Science and Technology emphasize the importance of the first two years STEM students engage with their educational pursuits. Many students are utilizing community colleges as avenues to pursue their first two years of higher education. However, the COVID-19 disruption contributed to a large drop in enrollments at institutions of higher education. The past decade has even proven to be detrimental for college enrollments and contributed to a decrease in STEM graduates.

Federal data indicate that 7 million students were enrolled in public two-year colleges during the 2020 – 2021 academic year, which is about 33% of undergraduate students (National Center for Education Statistics (NCES, 2022; CCRC, 2023)). The COVID-19 pandemic led to steep enrollment drops at community colleges and other institutions of higher education (CCRC, 2023; NCES, 2022). The National Student Clearinghouse Research Center (2022) estimates that 4.2 million students were enrolled in public two-year colleges in Spring 2022, down 7.8% from Spring 2021. The following Figure 1 provided by Community College Research Center (CCRC, 2022) shows a distribution over 10 years from 2010 to 2020 of students enrolled at 4-year institutions that qualified as community college transfer students (NCES, 2021). With the recent added
enrollment drops in 2021 and 2022 due to the disruption of the COVID-19 Pandemic, the need to increase retention and attrition rates is even more apparent.

![Figure 1 - Degree Seeking Transfer Students](image)

Even though enrollments have dropped drastically in the past 10 - 12 years, community colleges continue to act as pathway institutions for many students planning to pursue both STEM and non-STEM degrees. The reasons to attend community colleges are vast by students. The main reasons involve vocational training, skill development, financial reasons, developmental education, but others attend for the purpose of utilizing the transfer function with the hopes of transferring to a 4-year institution (Bahr et al., 2017; Jackson & Laanan, 2015). Lopez and Jones (2017) highlight that approximately 50% of students graduating with a STEM undergraduate degree and approximately 45% of graduate students obtaining a master’s degree in STEM indicated they previously attended community colleges during their academic careers (Lopez and Jones, 2017). Recent CCRC (2022) studies suggest that STEM transfer students at 4-year transferred introductory calculus courses from community colleges (Sansing-Helton, et al., 2021; Liu, V & Fay, M, 2020).
According to the Community College Research Center (2022), most community colleges in the United States offer the Calculus sequence. The Calculus sequence typically consists of courses that follow the curriculums that are consistent with Calculus 1 (Limits, Differential Calculus, & Intro to Integration), Calculus 2 (Integral Calculus & Intro to Power Series) and Calculus 3 (Multivariable Calculus & Vector Analysis) in the United States (Bressoud, D. & Vesa, M. & Rasmussen, C., 2015). Some institutions will combine a Differential Equations course with the common Calculus sequence (Wang, 2020). However, most institutions consider the calculus sequence consisting of the three above-mentioned courses. A few technical college institutions only offer up to Calculus 1 in the calculus sequence, but most offer the entire calculus sequence for associate of science and students preparing to utilize the transfer function (CCRC, 2022).

Community College transfer students that complete the calculus sequence at community colleges often do not progress towards advanced STEM coursework and graduate with STEM degrees (Fink et al., 2021). Other studies on STEM pathways suggest that community college transfer students are less successful in completing STEM degrees when transferring introductory calculus courses to 4-year or higher institutions (Hieb et al, 2015; Laugerman et al., 2015). The studies highlighted in this introduction indicate possible systemic barriers community college transfer students enrolled in calculus courses at 4-year colleges encounter, especially those who transferred introductory level calculus. Why are community college transfer students not successful in completing STEM at 4-year colleges when transferring calculus from the community college?

The studies highlighted suggest that there are systemic issues with the calculus sequence at community colleges, 4-year institutions and higher categorized institutions such as research-intensive institutions. The studies provide explorations into the enrollment and success rates of
community college transfer students pursuing STEM degrees at 4-year institutions. What about the lived experiences transfer students encounter while enrolled in Calculus at their transfer institutions? How are transfer students interpreting their lived experiences in Calculus at their transfer institutions? What are transfer students’ experiences like at a R1 institution? Transfer students are often given the title if they transfer from community colleges, but what about transfer students at R1 institutions that transferred from other 4-year non-R1 institutions? Given the increased need for STEM graduate in the United States, it is imperative that we as mathematics educators and researchers understand the experiences our students to provide a better learning environment for their successes in their academic pursuits.

1.1 Purpose and Research Questions

Purpose

At the time of this dissertation research, there were no research studies that examined transfer students’ experiences qualitatively in Calculus 2 at a very high research-intensive institution (R1). The Community College Research Center (2023) provides mostly quantitative research on the areas of Guided Pathways, Developmental Education, Teaching & Learning, College to Career, High School to College, Advising & Student Support with an emphasis on community college transfer students. There are few qualitative studies on the lived experiences of transfer students in calculus courses. Almost all the studies focus on community college transfer students’ experiences at 4-year non-R1 institutions. There are few qualitative studies on transfer students that investigate their transition experiences at 4-year institutions, but none explore transfer student’s perceptions of their transition in Calculus 2 at a R1 institution (CCRC, 2022; Lazarowicz, 2015; Ishanti, 2009; Alexander et al., 2009; Flaga, 2006). Furthermore, most studies investigating aspects of the calculus sequence tend to focus on Calculus 1 and less frequent studies on aspects of Calculus 2.
exist (Ahmad et al., 2022; Ferguson, 2020; Norton, P., 2020; Apkarian et al., 2018; Sellers et al., 2017; Bressoud & Rasmussen, 2015; Vestal et al., 2015).

My study will contribute to the body of knowledge of transfer students in the calculus through a careful exploration of transfer student perceptions of their transition and enhance the intellectual merit of this dissertation. Furthermore, this study will add to the minute body of literature on the Calculus 2 course. This endeavor was achieved by viewing my study through lens of a conceptual framework that explores the subconscious structures of the transition process and the employment of psychological phenomenological methods. A philosophical methodology used to explore and reveal the interpretations of perceived lived experiences. Additionally, this study provides interpretive descriptions of the essence of phenomenon by seeking emergent themes from the data. I will use the results of this study to bring awareness and support change for transfer students at R1 institutions. The goal of this study is to start a conversation with mathematics departments and faculty at R1 institutions about transfer students lived experiences in their calculus courses.

**Research Questions**

To achieve the project goal, my study was guided by the following research questions.

- **RQ1:** How do transfer students perceive and make sense of their transition experience in Calculus 2 at a research-intensive institution?
- **RQ2:** How do transfer students reflect on and understand their transition experience?
- **RQ3:** To what do they attribute to their success and/or lack of during the transition experience?

**1.2 Brief Overview of the Study**

I used criterion sampling, a type of purposeful sampling, to select transfer students enrolled at a very high research-intensive institutions (R1) in the Southeastern and Midwestern regions of the
United States. I collected data from these participants by conducting one-on-one semi-structured interviews using a protocol I developed based on my Conceptual Framework, education research literature, and pilot study results. I analyzed the data using \textit{a priori} coding and emergent coding techniques through a first cycle and elements of axial and selective coding during my second cycle to help seek emergent themes. Furthermore, I developed a coding team consisting of myself and undergraduate researcher interns (UPIC) to assist with the coding and ensure process reliability of handling the data as recommended for qualitative research (Creswell, 2007; Walther et al., 2013).

To explore how transfer students perceive their transition experience in Calculus 2 at a R1 institution, I designed my qualitative study by making use of psychological phenomenological methods as described by John W. Creswell (Creswell, 2007; Rossman & Rallis, 1998; Patton, 1990) and Clark Moustakas (Moustakas, 1994; van Manen, 1990). This involved an in-depth exploration into the lived experiences of the transfer students that participated in my study. Along with a deep analysis of the interviews through reading, coding, and clustering categories to seek emergent themes to interpret the lived experiences. The outcome of the analysis and researcher interpretations revealed emergent themes that provide structure to the essence of how the transfer students perceived and reflected on their transition experience and to what they attribute their success or lack of success in Calculus 2. In phenomenological studies, themes are structures used to explain the essence of the phenomenon under investigations (Moustakas, 1994; van Manen, 1990). My interpretations of the results were not possible without understanding my philosophical stances and my own personal positionality influencing this dissertation research.

\textbf{1.3 Researcher Positionality}

My educational journey began at a local community college in a small rural farming town in South GA. I spent 2 years as a student in a community college environment prior to my transfer to
a 4-year comprehensive institution in a rural town in GA. Approaching this study, I identify as a first-generation community college transfer student. My experiences as a transfer student certainly impacted my interest and decision to study this population of students at very high research-intensive institutions. I have personal perceptions and experiences as a mathematician, educator, transfer student, coming from a poor socio-economic background and being from a rural southern region of the United States with less educational opportunities available.

Also, I have experience with transfer students through my teaching assignments at community colleges and other institutions. I have encountered their worries as they prepare to transfer to research intensive institutions. I have encountered their difficulties while teaching at a very high research-intensive institution. I have experiences with other instructors at community college that challenge me to lower the quality of the content because “these students” cannot handle harder material. Similarly, I’ve experienced negative perceptions of transfer students at research intensive institutions from other instructors by thinking they are not prepared for the mathematics at this institution because the transfer students “have it easier at other institutions”. During my experience teaching Calculus 1 at a research-intensive institution, I encountered students that were not going to enroll in Calculus 2 at the research institution because of the negative rumors associated with the course. Additionally, I feel, despite the negative perception, that Calculus 1 at non-R1 institutions can be a good quality course and prepare students to complete Calculus 2 successfully at any institution they decide to transfer. I am completely aware of these biases that I have towards transfer students and how they have affected my approach to this study.

This work represents a deep passion of mine to understand the perceptions and experiences of other transfer students that have decided to transfer into a higher caliber research institution. Furthermore, my hope is that this work can help bring awareness to the needs of a student
population that are often overlooked at our institutions of higher education. Mathematics educators at both community college and research institutions need to be exposed to the perceptions of transfer students to understand their students as people who have their own individual identities that deserve to be respected and appreciated. Administrators need to be exposed to these perceptions to further help support the faculty roles as they encounter more transfer students and provide further support for the transfer students. My goal for this dissertation is start these conversations with mathematics instructors and administrators at all institutions of higher education.

1.4 Definitions of Terms

- **STEM** – The term STEM education refers to teaching and learning in science, technology, engineering, and mathematics. However, specific disciplines that colleges and organizations count as STEM vary per institution. The National Science Foundation (NSF) sometimes broadens the definition to include psychology and the social sciences but does not include clinical fields such as nursing (Granovskiy, 2018). For this dissertation, I adopt the definition from the NSF to include psychology and social sciences.

- **R1 Institution** – R1 is the Carnegie Measure for institutions that exhibit very high research activity at the university level.

- **4-year Institution (College)** – A 4-year institution is referred to as a baccalaureate granting university or college and some are considered as comprehensive institutions’ that grant up to master’s degrees or higher.

- **Non-R1 4-Year College** – A 4-year institution that is not labeled as a very high research activity institution by the Carnegie measure.
• Dual Enrollment Student – A high school student, typically a Junior or Senior, that enrolls in a community college or 4-year university to obtain college credit prior to graduating high school. They can complete the entire core curriculum (2 Years) prior to entering university (Crouse & Allen, 2014).

• Transfer Student – The Community College Research Center (CCRC, 2022) defines transfer students as those that have taken or attempted more than 12 semesters credits of college or university-level course work since high school graduation prior to attending a new institution and/or a dual enrollment student planning to attend college or university. This study conceptualizes transfer students as students enrolled at a R1 institution that transferred from any non-R1 institution, including dual-enrollment students. The non-R1 institutions can include Community Colleges, Technical Colleges, 4-year Comprehensive (Baccalaureate, M1, M2, M3), and Research Activity Institutions (R2 & R3).

• Community College Transfer Students – Students that began their higher education endeavors at a Community College and transfer into a 4-year college or university.

• Calculus Sequence – The calculus sequence, which consists of three university level calculus courses, Calculus 1, Calculus 2, and Calculus 3. Some institution considers the calculus sequence as four courses, that include a Differential Equations course, but for this dissertation, the calculus sequence refers to Calculus 1, Calculus 2, & Calculus 3.

• Calculus 1 – Calculus 1 is the first course taken in the calculus sequence and is often referred to as Differential Calculus. This course is important for STEM majors since it is usually a prerequisite requirement to further study in STEM degrees. The curriculum consists of the study of Limits, Differentiation, and Introduction to Integration (Burn & Mesa, 2015).
• Calculus 2 – Calculus 2 is the second course taken in the calculus sequence and is often referred to as Integral Calculus. This course relies heavily upon building from the concepts of integration that are introduced in Calculus 1. The general curriculum in Calculus 2 courses usually consist of Applications of the Definite Integral, Integration Techniques, Sequences & Series, Power Series Representations, Parametric Equations, and Polar Coordinates (Carney et al., 2021). However, Calculus 2 curriculums vary by institution types.

• Transition – “Any event, or non-event, that results in changed relationships, routines, assumptions, and roles” (Anderson & Goodman & Schlossberg, 2022, p. 33). I will describe the underlying theoretical framework that describes the phases of transition used in this dissertation further in Chapter 3 of this study.

1.5 Conclusion

This chapter discussed the main problem and purpose that served as a motivation for the efforts of exploring this study along with an overview for the reader. In addition, I discussed my overall positionality as I approached this study, and I defined important terms that are used extensively throughout this dissertation. Now that the problem and purpose have addressed, I will turn the attention to literature regarding calculus education and community college transfer students. The next chapter will highlight important literature from mathematics education and education research and discuss a gap in the literature addressing transfer students in Calculus 2.
Chapter 2

Literature Review

In this chapter, I summarize a brief history of calculus education literature, discuss the lacking literature in the context of Calculus 2, discuss previous important literature on community college transfer students and recent literature on community college transfer students at 4-year colleges in education research, and discuss the missing literature on transfer students in Calculus 2. The main purpose of this chapter is to provide further motivation for this dissertation work and provide a further case for the importance of this dissertation. At the time of this dissertation study, no other studies exist that focus the investigation into transfer students’ lived experiences in Calculus 2.

2.1 Brief History of Calculus Literature

Calculus continues to be a significant barrier for STEM students at institutions across the United States, especially introductory calculus, which are pre-requisites for advanced STEM coursework. Introductory calculus, Calculus 1 and 2, courses have proven to be the most difficult in the calculus sequence and deter progression through STEM focused degrees (Ferguson, 2020; Apkarian et al., 2018; Bressoud & Mesa & Rasmussen, 2015). Given the unexpected disruption of the COVID 19 pandemic, the shift from face-to-face teaching to online revealed even more challenges in calculus classrooms at colleges and universities across the US (Jungic, 2021; Al Rawashdeh et al., 2020). Understanding student success in calculus became more of a focus during the COVID 19 pandemic and revealed the importance of improving the teaching and learning of the calculus to increase the number of STEM graduates (Ahmad et al., 2022). Prior to the COVID
19 pandemic, Bressoud, Rasmussen, and Mesa (2015) investigated these issues by exploring contributing factors of introductory calculus courses that were affecting students’ success. The major findings from this study showed that pedagogical factors had a significant relationship with student performance and suggested that the use of student-centered pedagogies and active learning strategies was some important characteristics of successful calculus programs (Norton, 2020). With the disturbance of COVID 19, it became apparent the need to explore the contributing factors of the teaching and learning of calculus in the context of online learning.

The teaching and learning of calculus have been a subject of investigation for the past 50 years in mathematics education. It would be a daunting task to try and explain all the existing literature on calculus. However, most literature tends to focus on the success, motivation, performance of students in calculus, and the teaching and learning of the concepts of the limiting process, conceptualizing instantaneous rates of change, understanding the infinitesimal net change of covarying quantities, and representing the symbolic forms of the definite and indefinite integral (Thompson & Thompson, 1994; Zandieh, 2000; Oehrtman, 2009; Martin & Oehrtman, 2010; Jones, 2013; Bressoud & Mesa & Rasmussen, 2015; Norton & High & Bridges, 2017).

These research topics are mostly associated with the Calculus 1 course typically taught in the U.S. The Calculus 1 curriculum involves the concepts of the limit, differentiation, and an introduction to integration. The course is often considered to be transition mathematics since students must begin thinking about abstractions of the infinitesimals and how infinitesimal quantities covary (Bressoud & Mesa & Rasmussen, 2015; Oehrtman, 2009). Calculus 1 has been an important course to study because of its trajectory into the STEM fields. Most STEM degrees will require Calculus 1 and 2 as pre-requisite courses before pursuing advanced undergraduate STEM courses, which provides important reasons to study the calculus sequence (Roundy et al.,
2015). However, few studies of student’s perceptions of their transition experiences in calculus exist.

2.2 The Calculus 2 Literature

The largest study conducted on college calculus, by Bressoud, Mesa, & Rasmussen (2015) provides insight and recommendations for improving success of the calculus student, Calculus 1 Curriculum, and several recommendations for the teaching, learning, and coordination in Calculus 1, with some implications for improving Calculus 2 as a course at the college level. However, Calculus 2 is a course that is often neglected in providing research that would provide further insights into the success of students, teaching the content, and learning the concepts. Research exploring student experiences in Calculus 2 are scant. This is possibly due to the varying curriculums in Calculus 2 across the institution types (Bressoud, Mesa, & Rasmussen, 2015). The Calculus 2 curriculum can vary based on institution, but at most institutions the Calculus 2 curriculum consists of applications of the definite integral, a continuation of integration techniques, sequences & series, power series representations, polar coordinates, & parametric equations (Li et al., 2020).

The current body of knowledge and literature on student success, teaching, learning, and experiences in Calculus 2 is lacking. Most research tend to focus on the teaching and learning of the concepts in Calculus 2 such as Taylor Series representations and the convergence and divergence of sequences and series (Kocaleva et al., 2017; Martin & Oehrtman, 2015; Kadry & El Hami, 2014). Given the COVID 19 pandemic disruption, a renewed interest in the teaching and learning of Calculus 2 has emerged. With a recent study conducted at Texas Tech University, authors explored shifts in learning assistants’ self-determination due to the disruptions of COVID 19 in a Calculus 2 course delivery (Hite et al., 2021). Another study explored the effectiveness of
online learning in Calculus 2 and discovered that online teaching and learning of concepts in Calculus 2 were not effective during the COVID 19 pandemic (Susilawati et al., 2020). As of the writing of this dissertation, no studies have been conducted on transfer student experiences in Calculus 2 prior to COVID 19 or during the COVID 19 pandemic. Thus, this research will add knowledge and fill a research gap to the Calculus 2 literature by providing an exploration into the lived experiences of transfer students in Calculus 2.

2.3 Community College Transfer Students

Much literature exists in education research discussing community college students preparing for transfer, difficulties with the process, pathways, graduation and retention rates, and experiences transferring to 4-year institutions (CCRC, 2022; Lazarowicz, 2015; Hicks, 2014; Packard, Tuladhar, & Lee, 2013; Grites and McDonald, 2012; McGowan and Gawley, 2006). The study of transfer students from community colleges to 4-year colleges or universities has been an area of inquiry that has received attention from researchers and policy makers (Laanan, 2007). Laanan’s (2007) study quantitatively explored the dimensions of the adjustment process transfer students have at 4-year institutions. Furthermore, Laanan (2007) wrote that many students who transfer from community colleges to 4-year institutions have trouble adjusting to the rigorous academic standards, larger campus sizes, and are often faced with numerous challenges upon enrolling in 4-year institutions (Laanan, 2007). These challenges have been mainly attributed to the fact that community colleges and 4-year institutions differ greatly in size, location, academic rigor, competition among students, and embedded systemic barriers (Laanan, 2007; Cohen & Brower, 2003).

Other quantitative studies assessed the transition of community college transfer students adjusting to life at a 4-year institution and discuss the shift in academic and social patterns at the
4-year institution (Lopez & Jones, 2017; Berger & Malaney, 2003). Flaga’s (2006) famous qualitative study explored the process of transition for community college transfer students to 4-year institution. Flaga discovered Dimensions of Transition: Learning Resources, Connecting, Familiarity, Negotiating, and Integrating (Flaga, 2006). The dimensions outline strategies for transfer students to transition smoothly to the 4-year institution. This study was crucial in education research for community college transfer student’s research and began to identify hidden barriers. However, Flaga’s study was conducted almost 20 years prior to this dissertation work and focused entirely on community college transfer students.

More recent studies focus on retention and graduation of transfer students at 4-institutions. As highlighted by Bretschneider, Blekic and authors (2020) found community college transfer students often have lower levels of retention and degree completion when compared to traditional students who stay at the same institution for the duration of their degree (Bretschneider, 2022; Blekic et al., 2020). This gap in retention and graduation was identified quantitatively and is caused by many factors including transfer shock, lack of engagement on campus, loss of credits, low academic self-confidence, difficulty with adjustments and transition, and systemic barriers in institutional policy (Bretschneider, 2022; Blekic et al., 2020; Ishitani, 2008). Furthermore, Bretschneider (2022) finds transfer students often receive less attention and support than first-year students because administrators assume that because they are not new college students, they do not need the comprehensive orientation programming that is commonly implemented (Bretschneider, 2022). Additionally, Breschneider highlights “community college transfer students also face barriers in feeling accepted and supported at receiving institutions. Because transfer students are not included in the data that is used to evaluate retention rates at four-year institutions, transfer populations are often pushed aside by administrators” (Breschneider, pg. 12,
In addition to the barriers faced by community college transfer students, Alexander and colleagues (2009) point out that university instructors and administrators often do not view them as “real” or traditional students.

The previous and recent studies on the transition process for transfer students reveal interesting aspects of community college transfer student experiences at 4-year institutions. The studies discussed in this literature review tend to only focus quantitatively on degree pathways, attrition and retention, and persistence at 4-year institutions (CCRC, 2022; Lopez & Jones, 2017; Jackson & Laanan, 2015). The quantitative studies provide survey explorations into community college transfer students successes at 4-year or higher institutions. The studies are certainly important in providing quantitative investigations into the success and performance of transfer students at 4-year colleges. Along with Flaga’s dimensions of the transition for transfer students, Lazarowicz (2015) qualitatively investigated community college transfer students transitioning into a 4-year institution and found transition takes time, transition depends on funding college, support is critical for transitions, and highlighted maturity and personal responsibility as important aspects of transitioning into the larger 4-year institution.

These are some of the highlighted studies about transition and adjustments for community college transfer students at 4-year institutions. However, all the studies discussed focus on community college transfer students transitioning to non-R1 4-year institutions. This dissertation work considers transfer students to be those originally from community colleges and other non-R1 4-year institutions and currently enrolled at a R1 institution. Further qualitative research is needed to explore the experiences transfer students encounter at R1 institutions. This study aims to provide an empirical exploration into the lived experiences of transfer students at a R1 institution.
2.4 Literature Gap: Transfer Students in Calculus 2

As discussed, existing literature exploring experiences in Calculus 2 is lacking and qualitative studies on transfer students in STEM education are few. The major studies highlighted in this review found interesting results regarding student success in calculus, improving the teaching and learning, and quantitative explorations for the transition and successes of community college transfer students. The need for studying the population of transfer students at R1 institutions is important to keep in line with our nation’s endeavor to increase the number of STEM graduates since many students begin their academic careers at community colleges (Jenkins et al., 2020; Jaggers et al., 2016).

The challenging aspect to investigate is how transfer students are transitioning into institutions of higher Carnegie measures. Particularly, how are transfer students transitioning into Calculus 2 at very high research (R1) institutions with their previous Calculus 1 experience at a community college or other non-R1 4-year institution. Therefore, this dissertation work will add to the missing body of knowledge on transfer student’s transition experiences in Calculus 2 at very high research institutions and add to the lacking body of literature on investigations into Calculus 2 experiences.

As highlighted in this literature review, the study of the intersection of transfer students and Calculus 2 literature are scant. Therefore, a gap in the literature regarding transfer students’ experiences in Calculus 2 is identified and addressed in this dissertation work. The need to explore this intersection has been emphasized in the prior sections, with an emphasis on the need to increase STEM graduates in the U.S. I previously discussed the works of Laanan (2007) and Flaga (2006) that highlight aspects of the transition process for transfer students. The next chapter will discuss the psychological theories from the literature that describe the phases an individual will
subconsciously encounter during a transition. I will highlight a specific theoretical framework from psychology that frames transition along with a theoretical framework from education research that describes students’ experiences in their academic and social environments that lead to persisting or departing from an institution.
Chapter 3

Conceptual Framework

In this chapter I discuss the theoretical frameworks that provide structure to my work. The frameworks contributed to the conceptual framework I developed for my study to investigate the phenomenon of transition and the perceptions of transition. Furthermore, I discuss a pilot study conducted to test and refine the conceptual framework. I provide the results of the pilot study with a concluding discussion. Much of the content presented in this chapter has been presented as a peer reviewed conference paper for the American Society of Engineering Education Conference in 2022 (Edalgo, 2022).

Transition as a perceived experience by individuals is the phenomenon I explored in the context of transfer students in Calculus 2. I sought a guiding theoretical framework that explored transitions as a type of psychological behavior in the subconscious. Searching the psychological and education research literature for theories of transition, I discovered Schlossberg’s Transition Theory (1984, 2006, 2012, 2022) as a theoretical framework (Lazarowicz, 2015; Hicks, 2014). However, this framework is limited to usage in psychological and sociological studies, only recently becoming more ubiquitous in educational research studies pertaining to transition experiences, but at the time of this dissertation study, there is no use of Schlossberg’s Theory in STEM education research. To provide strength to this framework, I combined Schlossberg’s Framework with Tinto’s Framework to provide a theoretical support and to enhance my theoretical and pragmatic reliability in the study. Tinto’s framework has been widely used in educational research for several decades. This educational research framework follows a similar structure with constructs that overlap with concepts of Schlossberg’s framework. I provide a detailed discussion
below of each framework with devotion to the development of my conceptual framework that ultimately guided this dissertation.

3.1 Schlossberg’s Transition Framework

Schlossberg’s Theory is a counseling psychology framework used to understand how individuals perceive the phases of transitions experienced in life as subconscious processes (Schlossberg, et al., 2022). The theoretical constructs were developed by psychologist Nancy Schlossberg during the 1980’s and evolved into the current theoretical framework depicted in Figure 2. Schlossberg explains transitions can be described in three phases of the process; moving in, moving through, and moving out of the transition (Edalgo, 2022; Schlossberg et al., 2022, 2012, 2006; Schlossberg, 1995, 1984). Schlossberg argues that the moving in phases consists of beginning to understand the type of transition an individual approaches, and the moving through phase consists of taking stock of coping mechanisms that explore the perceptions of assets and liabilities of personal characteristics, personal situations, forms of support, and strategies for coping with the transition experience and preparing to move out of the transition (Edalgo, 2022; Schlossberg et al., 2022). Schlossberg emphasizes that the phases of transition are displayed as an assumption of individual perceptions of the transition process (Edalgo, 2022; Lazarowicz, 2015). For this study, the phases of the transition process are a subconscious process individuals encounter as they are living the phases and interact with their experiential world.
Moving In - Approaching Transitions

Schlossberg (2022) emphasizes the importance of understanding the events leading to a particular transition. This phase of the framework identifies the types of transition individuals encounter subconsciously. Schlossberg (2022) identified three types of transitions: Anticipated Transition, Unanticipated Transition, & the Non-Event Transition. Anticipated transitions are expected normative events that warrant adequate preparation for the transition (Lazarowicz, 2015). Non-Anticipated transitions are unexpected life events that disrupt the normal routine of life and usually involve a crisis or unexpected emergency (Schlossberg et al., 2022). Non-Event transitions are expected events that do not occur, such as, the expectation of attending a specific institution that does not come to fruition (Hicks, 2014). This phase of the transition is important for understanding the type of transition and any personal attributes, characteristics, preparations, and situations an individual has approaching the transition that can help with the underlying perceptions of preparing for the moving through phase. It is important to understand this phase of the transition process because it directly affects the coping mechanisms as the moving through phase begins.
Moving Through – Taking Stock of Coping Resources

Taking stock of coping resources is an important aspect of moving through the transition process. This phase of the framework is concerned with the process of transition and how one gets through a transition successfully or unsuccessfully. Schlossberg (2022) describes coping mechanisms, the 4 S’s, (self, situation, support, & strategies) and stresses the importance of how individuals perceive the 4 S’s as either assets (positives) or liabilities (negatives). The mechanisms are constructs that one subconsciously uses while a transition is taking place (Lazarowicz, 2015). This phase of the framework is considered the most important since individuals are in the process of seeking any cognitive structures in the conscious state to help cope with the transition. Individuals tend to rely on any of the coping mechanisms to help understand, perceive, and successfully move through the transition (Lazarowicz, 2015; Hicks, 2014). Schlossberg (2022) suggests that support and strategies tend to be the focal constructs that individuals physically rely on, and the self and situation are constructs that individuals are subconsciously engaging as they move through the transition.

Moving Out – Preparing to Move in Again

This phase of the transition involves exhausting all the available coping mechanisms and resolving the transition while beginning a new transition subconsciously (Schlossberg et al., 2022). Ambivalence is a common experience during this stage, since individuals always subconsciously perpetuate transitions, often unaware. Schlossberg (1995) considers this stage as “Moving Out and Moving in Again”. The phase can be thought of as cyclical since when we take stock of all the coping mechanisms, prepare to move out of the transition, subconsciously another transition begins (Edalgo, 2022). Students in this phase will prepare for graduation, complete a semester,
complete a course, etc. (Edalgo, 2022). However, for the theoretical purpose of this dissertation research, my interpretation of the framework will focus on the process of the transition as Moving In, Moving Through, and Moving Out, not the cyclical perspective that Schlossberg (1984) originally described.

3.2 Tinto’s Persistence/Departure Framework

Other additional constructs that are needed for the study are transfer students’ goals, academic and social systems approaching the transition and moving through the transition. Schlossberg’s framework does not account for these constructs and is limited by usage in psychology and sociology studies. Tinto’s Departure/Persistence Framework accounts for goal commitments, academic and social systems, and this framework provides a theoretical support to Schlossberg and enhances the theoretical reliability (Tinto, 2012, 2007, 2004, 1997, 1973).

Tinto’s Theory theorizes that students who are academically and socially integrated into the campus community increase their commitment to the institution and are more likely to persist to graduation (Tinto, 2012). The constructs of the framework are mainly positioned to theorize about student engagement in an academic and social system. Ultimately, we want transfer students to persist to graduation and course completions, but those that do not are likely due to a lack of both academic and social integration at the institution, which these type of integrations are necessary for persistence (Mendez, 2001). Tinto (2012) identified 3 sources that contribute to students departing an institution or being unsuccessful in a course: academic difficulties, inability of individuals to resolve their educational and occupational goals, and their failure to become or remain incorporated in the intellectual and social life of the institution (Wilson, 2019; Tinto, 2012). Tinto’s original theory has been cited widely in higher education and revised over several decades (Tinto, 2012, 2007, 1973). A version of the framework is depicted below in Figure 3 (Tinto, 2007).
3.3 Conceptual Framework

To completely investigate the transition as a phenomenon and ensure theoretical validity ($Q^3$) the theoretical frameworks were combined to develop a conceptual framework to understand transfer student perceptions and sense making of their transition. The conceptual framework places emphasis on Schlossberg’s Theory by using the constructs as a foundation for the framework with concepts of Tinto’s theory embedded within the relevant constructs of Schlossberg’s framework. I interpreted the conception of this framework by noticing overlaps of both Schlossberg’s Theory and Tinto’s Theory. This alignment was conceived of to increase the theoretical and pragmatic validity of the research due to the limited use of Schlossberg’s Theory in education research. Without any presumptuous notions, the conceptual framework combines psychological theories with educational constructs. A depiction of the conceptual framework used in this study is provided in Figure 4 (Edalgo, 2022).
The main framework guiding this conceptual framework is Schlossberg’s Transition Theory. There are constructs embedded from Tinto’s Theory in each phase of the transition. The Moving In phase contains the constructs of Familial Background, Personal Attributes, and Prerequisites. These were embedded in Schlossberg’s Theory to add theoretical support to the Moving In phase. The Moving Through phase contains Schlossberg’s constructs of coping mechanisms embedded through the academic and social systems from Tinto’s Theory. Since my study is interested in the transition in Calculus 2, the transition can interact within the academic and social environments of the participants and within these environments the participants subconsciously encounter their coping mechanisms to move through the transition. The Goal Commitments construct from Tinto’s Theory adds to the transition aspect of having goals through
the phases of the transition and whether these goals change as the participant moves through the phases of the transition. The final phase of the transition involves taking charge and stock of all coping mechanisms to successfully move out of the transition. The Departure or Persistence construct gives an outcome to the moving out phase. I interpreted this construct to add theoretical support to moving out of the transition into Calculus 2. The conceptual framework does not use every construct of Tinto’s Theory. The framework neglects Academic and Social Integration, Grade Performance, Intellectual Development, Peer and Faculty Interactions, and Institutional Commitments as constructs that are related to Tinto’s theory (Tinto, 2007, 1973).

Recall, the research questions guiding this dissertation involve the perception and sense making of the transition, reflection and understanding of the transition, and what attributes to the successes or lack of successes during the transition. I interpret the perception and sense making of the transition to align within the Moving In and Moving Through phases of the conceptual framework, since the participants will be preparing for this transition and living the transition during these phases. The reflection and understanding of the transition I interpret aligns with all three phases of the conceptual framework since participants are reflecting on their transition through the phases of the transition and reaching an understanding of this reflection. Lastly, the attributes of success and lack of success during the transition aligns with the Moving Out phase, as this phase involves understanding the final aspects of the transition and if the transition will be successful or not successful.

3.4 Pilot Study

To gain a deeper insight into the use of my conceptual framework, development of research questions and revising the interview protocol. I conducted a pilot study during the Spring semester of 2021 at the height of the COVID-19 pandemic. The results of the pilot study were pessimistic
in that the themes that emerged focused on negative attributes the participant’s encountered within their Calculus 2 experiences. The limitation of this pilot study is that it was conducted during an extremely ambiguous time in education. The abrupt and unexpected pedagogical shift sent panic in instructors and students alike. Most instructors were not prepared to teach Calculus 2 online and students typically prefer face-to-face mathematics courses as opposed to online instruction (Salam & Sharill, 2014). In the next sub-sections I will discuss the methods I used to collect and analyze the data, participants information from the semi-structured interviews, and the results of the pilot study further.

Data Collection

I recruited 4 transfer students enrolled in Calculus 2 at a R1 institution in the southeastern region of the United States for an in-depth interview. Each student was provided a $20 Amazon gift card as a research incentive. Two of the transfer students were bridge transfer students. Bridge transfer students are students that begin their college career at a 2-year institution that has a bridge commitment with a larger 4 year or R1 institution. These programs are designed to help students get started with their core curriculum courses at smaller institutions and bridge over to the larger institution once they meet a certain criterion developed by the bridge program. In addition to the two bridge students, the other two students were dual enrollment students during their Calculus 1 enrollment. Dual enrollment students usually are high school students that can enroll in college courses at 2 year and 4-year institutions while they are completing their high school curriculum. Below I summarize each student’s experience:

Alex

Alex started college as a bridge student at a community college in the southeastern region of the U.S. He began as a general engineering major with hopes to pursue mechanical engineering
at the R1 institution. His Calculus 1 course was taught from a flipped classroom perspective, and he described the course as good despite not enjoying that teaching modality. Alex feels confident leaving Calculus 1 as approaching the transfer into the R1 and feels like he gained confidence in Calculus 1. Alex felt that professors at R1 would be like community college and had this expectation transferring into the R1 but decided this was not true during his experience in Calculus 2. He expressed a negative experience in Calculus 2 with less support and interactions with instructor. He still has hope to obtain a C in the course, so he doesn’t have to repeat the course again.

**Dana**

Dana began enrolling in college courses at a community college in the southeast as a dual enrollment student at her local high school. She has ambitions to become a robotics engineer and expressed interest in artificial intelligence and machine learning. She completed Calculus 1 as a dual enrollment student and described her experience as good and supportive. She felt prepared and confident leaving Calculus 1 since she enjoyed the face-to-face teaching and had those expectations preparing for transfer to the R1 institution. She did not like the flipped classroom perspective in Calculus 2 and felt like they were set up for failure in Calculus 2 at the R1 due to lack of support and no preparation for success. She still plans to pursue robotics engineering and seemed to be optimistic about the future especially when completing Calculus 2.

**Jane**

Jane started her college career as a dual enrollment student at a community college in the northeastern region of the U.S. prior to transferring to a R1 in the southeast. She completed Calculus 1 at the community college and expressed an overall positive experience at the community college. She felt confident and prepared for Calculus 2 at the R1. Prior to transfer, she
planned to pursue a degree in architecture and switched to computer science while enrolled in Calculus 2. She had an overall negative experience in Calculus 2 due to the lack of support and engagement. She feels like she utilized all her strategies and exhausted the usage of campus resources for supplemental help in Calculus 2. Due to her experience in Calculus 2, Jane completely switched her major to early childhood education and doesn’t plan to retake Calculus 2. She started as a STEM major and ultimately changed to early childhood education because of her experience in Calculus 2.

**Lucy**

Lucy started as a bridge student at a community college in the southeast and transferred to a R1 institution near the community college. She completed Calculus 1 at the community college and considered the course positive with lots of support and engagement from the instructor and her peers. She really felt prepared and confident in her mathematical abilities leaving the community college and she was excited to transfer to the larger R1 institution that most of her friends attended. She planned to pursue a career in ecology because of her love of biology and studying the natural world. She seemed to “light up” when speaking about Calculus 1 and her future. However, this changed for Lucy when describing her Calculus 2 experience at the R1. She expressed a negative experience and transition into Calculus 2 due to the material becoming more intense and feeling overwhelmed. Lucy described negative feelings of relearning material she felt confident about, and this became detrimental to her overall confidence in the calculus. She continued to express interest in pursuing her passion for ecology, but she might enroll in Calculus 2 at her previous community college because of the comfort she felt at this institution.
Data Analysis

The interviews were transcribed using a transcription service and the transcripts were cleaned by a coding team of myself and two undergraduate research intern students at a very high research-intensive institution. The coding team developed a priori codes using the conceptual framework before analysis began (Saldaña, 2016). Once we began analyzing the transcripts, we used an emergent coding approach with predetermined a priori codes and kept track of other codes that emerged throughout the analysis. Categories were then developed and clustered based on common themes that emerged throughout the analysis. To ensure quality during the analysis, the coding team used interrater reliability by coding together and separately, and meeting to reach agreements on codes or disagreements with at least an 80% reliability (Belur et al., 2021).

Pilot Study Results

Analysis of the pilot data revealed many perceptions of transfer student’s experiences in Calculus 1 and their transition into Calculus 2 at a R1 institution. The emergent themes appeared to align with Schlossberg’s Framework and the Academic and Social System constructs of Tinto’s Framework. The emergent themes influenced a refinement of my research questions and interview protocol. To summarize, the main themes emphasized by the transfer students are depicted below along with the heading of the construct from the conceptual framework that I interpreted as the theme aligned with the underlying theories.

Moving In

Theme 1 - Students expressed positive experience in Calculus 1 at the students transfer institution which influenced personal strengths approaching their transition to Calculus 2.
“Because I had such easy access to tutors and assistance, and because my professor was so good in my Calc one class, I for some reason just expected it to be the same when I transferred. When I transferred, I had this idea that all professors genuinely cared about you, and they genuinely cared about your success, and then I got to R1 University and learned that I was wrong.” – Alex

Moving Through

Theme 2 - Negative experience in Calculus 2 at R1 institution by feelings of despair, lack of support, and set up for failure.

“There was no prep, there wasn't a lot of assistance. And then when I say they threw us into the deep end, I also mean that they threw us in without any type of floatie or anything to keep our head above water. They threw us in, and then pushed on our heads. It felt just so ... like we were not going to be set up for success.” – Dana

Theme 3 - Transfer students sought support and utilized their strategies to be successful in Calculus 2 at R1.

“I personally feel like I did all the things that you should have done as a student, which was seek your professors help, and then seek a tutor and then I went to the Academic Success Center, realized I wasn't getting enough help and then saw a separate tutor, like a private tutor, and I paid for him.” – Jane

Moving Out

Theme 4 - Transfer students expressed feelings of a negative transition into Calculus 2 at a R1 institution and feelings of having to relearn prior content.
"But my transition into the Calc two class was negative, it just felt like everything intensified, tenfold. All the concepts that I thought that I knew, I felt like I knew nothing, and they were teaching them in a different way than I learned them. So then to do the math the way that they wanted, I had to relearn the initial math that I learned that we're supposed to be building on, and then teach myself, or have them teach me or assist me in the second part of the learning which is the building upon part. And so, I felt like I was basically retaking Calc one and Calc two at the same time, but relearning and reteaching myself everything from Calc one, because they weren't providing that assistance and then also doing the build upon stuff that was supposed to be for Calc two." – Lucy

**Conclusion**

The themes represent a small cohort of transfer student perceptions and warrant the need for further exploration. Moreover, it is worth noting that these results are reflective of student perceptions during the COVID-19 pandemic which I recognize could result in the negative themes presented. The positive experience in Calculus 1 could be attributed to pre-Covid environments and the negativity because of the classroom environments shifting from in-person classes to an online classroom in such an abrupt manner. The results provide some insight into the transfer student perceptions of their transition into Calculus 2 at a research-intensive institution. The results warrant a negative experience in Calculus 2 at a research-intensive institution and a positive experience in Calculus 1 at a community college. Concluding, the results of this study were further used to help refine the interview protocol and improve upon the precision of the guiding research questions. This study enhanced the theoretical and pragmatic validity by ensuring the alignment of the conceptual framework and the social reality of the study. The pilot study provided further confidence in using the conceived conceptual framework to guide the dissertation research study.
In this chapter, I discuss my overall theoretical perspective as a qualitative researcher and how I structured my personal educational paradigm. I believe the educational paradigm provides the foundational philosophies that guide any educational researcher’s study and deserves a coherent discussion to help formulate the philosophical underpinnings of a research study. Furthermore, as a qualitative researcher, it is important to self-reflect by identifying my research positionality and theoretical perspective to help guide the approach of data collection, analysis, and the reporting of any findings.

4.1 Philosophical Perspectives

The guiding philosophical assumptions that any qualitative researcher utilizes is an important constraint revealed during reflexivity are usually comprised of their epistemological and ontological stances. These concepts are important because they directly shape the paradigmatic approach to the entire research study. Understanding individual perceptions of reality and the acquirement of knowledge along with researcher positionalities and perspectives are important considerations for the quality of qualitative research (Duberley et al., 2014). Below I discuss my philosophical perspectives and my overall educational paradigm I align with for this qualitative dissertation study.

Epistemological Stance

Epistemology is the study of knowledge or how one obtains knowledge (Crotty, 2003). The guiding epistemology for this dissertation is that of constructivism (Creswell et al., 2011).
According to Mills (2013), Constructivism is “the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world and developed and transmitted within an essentially social context” (Mills, 2013, p. 40). The researcher constructs their understanding of the data by engaging with the data and the participants throughout the data collection and analysis process, and constructing meaning through their interpretations (Tallman, 2015). The epistemology of constructivism adopts the point of view that individuals construct their own social realities and knowledge, and it is not possible to construct an objective reality, because any such description of the social reality is subject to the individual’s interpretations (Mills, 2013; Piaget, 1977). Hence, “constructivism asserts that the only reality an individual may come to know is the reality one constructs from the basis of experience, or interaction with the environment” through the cognitive processes of equilibration, assimilation and accommodation of *cognitive structures or schemas* (Tallman, 2015, pg. 55). This is important for this dissertation research because in this work I focus on the participants’ experiences and their perceptions of their transition and lives as transfer students at a very high research-intensive institution. My exploration will focus on their perceptions and interpretations of their experiential world.

**Ontological Stance**

Ontology is a philosophical concept that attempts to define the study of the nature of reality. According to Guba & Lincoln, (1994) the ontological consideration is what is the form and nature of reality and therefore, what can be known about it is “how things really are” and “how things really work” (Battle & Serrano, 2022; Guba & Lincoln, 1994). The *ontological stance guiding this dissertation research, is that of an interpretivist stance*. As the researcher, I cannot be separated from the research study, and I am deeply connected to the social situation of the perceived
experience of the transition by transfer students in Calculus 2. I am a part of the socially constructed reality under investigation since I have been a transfer student and taught transfer students in both Calculus 1 and 2. I am extremely committed to interpreting the data from the transfer students in this social situation. I express a deep care for the success of transfer students in calculus and my interpretations of their lived experience in Calculus 2.

4.2 Theoretical Perspective

Combining both the epistemological and ontological stance, my informed theoretical perspective for this dissertation is radical constructivism. Also, known as constructionism, Von Glasersfeld (1995) developed the psychological learning theory of radical constructivism as an elaboration or extension of Piaget’s genetic epistemology (Tallman, 2015; Piaget 1971, 1977). The radical qualifier emphasizes von Glasersfeld’s position that cognitive processing is the foundation of the only reality an individual may come to know and understand by constructing their reality through interacting with their reality through the processes of assimilation and accommodation of cognitive schemas (Tallman, 2015).

This theoretical perspective indicates it’s not possible to verify whether one’s knowledge corresponds to external reality since it relies upon interpretations of their external reality. Therefore, radical constructivism replaces the notion of objective truth with the notion of viability within the subjects’ experiential world, which involves understanding one’s own personal interpretations and perceptions (Tallman, 2015; von Glasersfeld, 1995). In the words of Tallman (2015), “an individual’s knowledge of the world is “correct” not because it resembles external reality but because the individual constructs this reality through interpretations of the world” (Tallman, 2015, p. 56).
This theoretical perspective provided a lens to make, analyze, interpret, and handle the data for this research, which enhances the quality and strength of the research. In particular, the radical constructivist perspective gave me a theoretical grounding to approach the data in an iterative manner and enhance the trustworthiness and quality of my own interpretations and perceptions of the data (Mills, 2013; Lincoln & Guba, 1985). Thus, throughout my data analysis, I constructed my results based on the patterns I interpreted in the analysis from the data by being very closely involved with making and handling the data. The theoretical perspective allowed me to interpret the clustered codes, categories, and subthemes to seek the emergent themes and my findings through deeper interpretations. This allowed me to align my themes with my pursuit of addressing my research questions and aligning the themes to my conceptual framework.

4.3 Educational Paradigm

The joint understanding of my philosophical stances, overall theoretical perspective, and my researcher positionality along with the statement of my research questions and guiding conceptual framework, informs and justifies my methodological choice of phenomenological methods. Guided by these foundational constructs for this dissertation, I summarize in the following Table 1 on the page all the elements that form my educational paradigm for this study, as depicted by Pfirman (2018) and Crotty (2003). A further discussion of my methodological research design will be presented in the following Chapter 5 of this dissertation study.

<table>
<thead>
<tr>
<th>Philosophies</th>
<th>Definition</th>
<th>Selection</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual Framework*</td>
<td>Formal theory guiding or framing research study.</td>
<td>Schlossberg’s Transition Theory &amp; Tinto’s Persistence/Departure Theory</td>
<td>Framework describes individual perceptions of the phases of the transition experience.</td>
</tr>
<tr>
<td>Epistemology</td>
<td>The relationship of knower to the known.</td>
<td>Constructivist</td>
<td>Individual’s construct their reality in a social context.</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>Ontology</td>
<td>The nature of reality.</td>
<td>Interpretivist</td>
<td>The knower and known are inseparable. Researcher connected to the social reality.</td>
</tr>
<tr>
<td>Theoretical Perspective</td>
<td>Overall Philosophy informing methodology.</td>
<td>Radical Constructivist</td>
<td>Understanding the world by interpretations and constructed through viability.</td>
</tr>
<tr>
<td>Methodology</td>
<td>Philosophical justification for research design.</td>
<td>Phenomenology</td>
<td>Explore the essence of a phenomenon and interpret lived experiences.</td>
</tr>
<tr>
<td>Methods</td>
<td>Making Data</td>
<td>Semi-Structured Interviews</td>
<td>In-depth Open-ended questions with emergent follow up questions.</td>
</tr>
<tr>
<td></td>
<td>Handling Data</td>
<td>Procedures used to collect and analyze data predicated on the methodology.</td>
<td>Coding Team</td>
</tr>
<tr>
<td></td>
<td>Quality</td>
<td>Q³ Framework</td>
<td>Quality framework embedded throughout the interview protocol to mitigate bias and ensure validity and reliability.</td>
</tr>
</tbody>
</table>

*Not a part of Crotty’s or Pfirmann’s elements of theoretical perspectives in research*
Chapter 5

Research Methods

In this chapter, I discuss the research methodology I employed to help me investigate and explore my research questions. I provide an overall justification for my methodological choice with an in-depth exploration of the methodology from a philosophical perspective. A discussion of the data collection process including the sampling techniques I used, and brief summaries of the participants of this study. I discuss how the interview protocol aligns with the conceptual framework. I discuss the analysis used to organize the data and seek the overall emergent themes. I conclude this chapter with a discussion of the $Q^3$ framework I used to strengthen my research by ensuring validity and reliability.

5.1 Institutional Review Board and Approval

The research pursued in this study was approved by Clemson University Institutional Review Board (IRB) number IRB-2021-0283. Recruitment email, consent form, and interview protocol were all approved by Clemson University IRB and administered in a manner consistent with ethical human subject’s research. Please see the Appendices for recruitment emails, consent form, and interview protocol.

5.2 Methodology Justification

Recall the research questions guiding this study are the following:

- RQ1: How do transfer students perceive and make sense of their transition experience in Calculus 2 at a research-intensive institution?
• RQ2: How do transfer students reflect on and understand their transition experience?

• RQ3: To what do they attribute to their success and/or lack of during the transition experience?

The nature of the questions lend themselves to a phenomenological study design. Phenomenological studies are intended to investigate “how people engage and interact with a phenomenon: what they perceive, how they make sense, and how they understand and interpret the phenomenon” (Gallagher, 2016, pg. 16). Phenomenology analyzes the data from an unbiased lens to present the essence of the participant’s voice interpreted by the researcher (Pfirman, 2018).

Qualitative studies that explore phenomenon often employ the methodologies of phenomenology, phenomenography, and grounded theory. Each methodology contains similarities and differences within the context of investigating a phenomenon. Although, mentioned above that this dissertation study is guided by research questions that are phenomenological in essence. It is important to provide a depiction of the methodological differences and strengthen the justification for my usage of phenomenological methods. The following Table 2 represents the methodological comparisons and differences between phenomenology, phenomenography, and grounded theory approaches adapted from Pfirman’s (2018) comparisons and contrasts of the methodologies (Moser & Korstjen, 2018; Pfirman, 2018; Forster, 2012; Strauss & Corbin, 2008; Creswell, 2007; Larsson & Holmström, 2007; Charmaz, 2006; Bowden & Green, 2005).

**Table 2** - Phenomenology, Phenomenography, & Grounded Theory Qualitative Methodologies

<table>
<thead>
<tr>
<th>Methods</th>
<th>Phenomenology</th>
<th>Phenomenography</th>
<th>Grounded Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

51
<table>
<thead>
<tr>
<th>Purpose</th>
<th>To explore the essence of a phenomenon. How humans interact with the phenomenon and perceive the phenomenon.</th>
<th>To explore the variations of how a phenomenon is experienced amongst a collective group.</th>
<th>To find a theoretical model that explains a particular phenomenon under investigation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of Description</td>
<td>Perception of Phenomenon</td>
<td>Experience of Phenomenon</td>
<td>Theory of Phenomenon</td>
</tr>
<tr>
<td>Sampling</td>
<td>Purposive Sampling/ Criterion Sampling</td>
<td>Purposive Sampling/ Maximum Variation Sampling 10 – 20 Participants</td>
<td>Theoretical Sampling</td>
</tr>
<tr>
<td></td>
<td>8 – 15 Participants or until Data Saturation is achieved</td>
<td></td>
<td>Reach Theoretical Saturation</td>
</tr>
<tr>
<td>Data Collection</td>
<td>Any type of Qualitative Data (Interviews most Common)</td>
<td>Any type of Qualitative Data (Interviews most Common)</td>
<td>Data that will help ground the development of a theoretical model. Several Phases of Data Collection.</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>Thematic Analysis / Coding / Identifying Statements</td>
<td>Seeking Themes / Find structure for Outcome Space</td>
<td>Perpetual Coding and Analysis until saturation is reached to build theoretical model</td>
</tr>
<tr>
<td>Results/Outcomes</td>
<td>Rich Description of Phenomenon/ Lived Experience</td>
<td>Outcome Space of the Variations of Phenomenon</td>
<td>Theoretical Model</td>
</tr>
</tbody>
</table>

In summary, the phenomenological methodology aligns well with the overall Radical Constructivist theoretical perspective and usage of my conceived conceptual framework, as the phenomenon is interpreted by the individual through cognitive processes in the subconscious. The
objective truth of the phenomenon is constructed by the assimilation and accommodation of the
cognitive schemas that form the understanding and interpretation of the phenomenon (Schlossberg,
2006; Piaget, 1977; Husserl, 1931). Phenomenology’s are intended to provide an in-depth
investigation into the perception and interpretation of the lived experience or phenomenon. In
addition, phenomenology’s bring awareness to the description and interpretation of the essence of
the phenomenon through the emergent themes as structures of the phenomenon’s essence.
Therefore, this dissertation study aims to utilize the results to provide and give voice to the transfer
student’s experiences of their transition in Calculus 2 at a large research-intensive institution by
conducting an in-depth investigation into their lived experiences.

5.3 Introduction to Phenomenological Methods

Phenomenology is a complex qualitative method of inquiry that warrants some philosophical
discussion before my methodological approach is displayed. There are several approaches to
phenomenology and my approach will use aspects of types of methods that form a basis to my
interpretation of psychological phenomenology (Moustakas, 1994). I discovered this
phenomenological method through the exploration of research methods that investigate the lived
experiences of individuals. Concepts and constructs of phenomenological methods are situated in
the field of philosophy. The concept of completely removing an individual’s bias is a foundation
to understanding the original foundational concept of phenomenology.

Epoche - Bracketing

Husserl’s (1931) original conception of phenomenology involved a philosophical method
that truly bracketed the essence of the phenomenon through the process of *eidetic reduction*. This
process requires the researcher to perpetually mitigate bias, theories, experiences, pre-existing
knowledge or any contributing factor that would obscure the phenomenon by “essence reduction”
(Gearing, 2004; Heidegger, 1962). Husserl (1931) referred to this process as the theory of *epoche*. The most important philosophical aspect of pure phenomenology is the theory of *epoche* or suspending one’s judgement (Gearing, 2004). For qualitative research, this concept is now widely accepted as *bracketing*. While I agree with this method of suspending one’s judgement, I do think it is impossible to completely bracket all the implicit bias, understandings, theories, and experiences. I do believe that it is necessary to employ bracketing to mitigate my bias as much as possible to ensure a *reflexive interpretation*. Bracketing should be a continual process during the entire research design and plan (Creswell, 2007). I will discuss my approaches to bracketing in the validity and reliability section of this chapter.

**Psychological Phenomenology**

Another aspect of pure phenomenology involves providing a deep rich description of the essence of the phenomenon under investigation. However, I believe that any researcher analyzing data providing a description relies on the *researcher’s interpretation* of the data. This belief, along with my employment of *epoche*, I combined concepts of Heidegger’s Hermeneutic Phenomenology clustered with aspects of Husserl’s pure phenomenology to form Moustakas Psychological Phenomenology (Heidegger, 1962; van Manen, 1990; Moustakas, 1994; Creswell, 2007). The following Figure 5 represents my interpretation of Moustakas Psychological Phenomenology research design which I followed with bracketing being a continual process throughout the study grouped with the usage of the *Q*³ Framework for validity and reliability (van Manen, 1990; Moustakas, 1994; Creswell, 2007).
Psychological Phenomenology combines the foundational philosophical concepts Husserl developed for his Pure Phenomenology with Heidegger’s Hermeneutical Phenomenology. That is, Husserl’s Phenomenology relied on *eidetic reduction* as a process to completely reduce the essence of the phenomenon by completely removing any pre-conceived notion of understanding of the phenomenon to reveal the pure *eidos*. Provide a rich description to completely understand the phenomenon. Heidegger, a student of Husserl, questioned the notion of *epoche*, by noting the impossibility of removing oneself or mitigating one’s complete understanding of a phenomenon. In other words, bracketing is an important aspect of phenomenology, but it shouldn’t be the defining concept of uncovering the essence. Moreover, to *provide a description*, one must *interpret* the revealed essence of the phenomenon. That is why I align more with Heidegger and adapted Moustakas’s view of phenomenological methods.

### 5.4 Sampling – Participant Selection

It is important in phenomenological studies to ensure participants are selected during and after they have lived the experience (Creswell, 2007). Unfortunately, neither Creswell nor Moustakas provide a technique for sampling in phenomenological studies. However, while
searching the literature, I found a type of purposeful sampling, titled “criterion sampling”, used in phenomenology for researchers to set criteria for participants to satisfy to ensure a proxy for the experience of the phenomenon (Moser & Korstjen, 2018). I used this type of sampling to refine my selection of participants. The following Table 3 shows my original criteria I used to recruit participants.

**Table 3 - Original Criteria for Sampling**

<table>
<thead>
<tr>
<th>Sampling Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• New Transfer Students to the research-intensive institution (R1).</td>
</tr>
<tr>
<td>• Transferred from 2-year Community College and/or a non-R1 institution.</td>
</tr>
<tr>
<td>• Completed Calculus 1 at prior institution and transferring Calculus 1 to R1.</td>
</tr>
<tr>
<td>• First time enrolling in Calculus 2 at the R1.</td>
</tr>
<tr>
<td>• Currently enrolled in Calculus 2 at the R1.</td>
</tr>
<tr>
<td>• Full time or Part time student.</td>
</tr>
<tr>
<td>• Not previously enrolled in Calculus 2 at non-R1 or R1 institutions.</td>
</tr>
</tbody>
</table>

After receiving incentive funding from working on a Howard Hughes Medical Institute grant as a graduate research assistant. I requested from the course coordinator of Calculus 2; a list of students enrolled in Calculus 2 at a research-intensive institution in the southeastern region of the United States. Using this list, I sent out a recruitment email with consent form to the students encouraging them to participate in the study with an incentive of $25 Amazon Gift Card. After a month of limited responses, I talked with committee members who helped distribute my recruitment email and informed consent to other research-intensive institutions in the southeastern and midwestern regions of the United States. Evaluating the interested responses, I received to
participate, it became clear to me that I needed to revise my criteria for recruitment. The following Table 4 depicts my revised criteria used to select the interview participants.

**Table 4 - Final Criteria for Sampling**

<table>
<thead>
<tr>
<th>Finalized Sampling Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• New Transfer Students to the research-intensive institution (R1).</td>
</tr>
<tr>
<td>• Transferred from 2-year Community College and/or a non-R1 institution.</td>
</tr>
<tr>
<td>• Completed Calculus 1 at prior institution and transferring Calculus 1 to R1.</td>
</tr>
<tr>
<td>• Currently enrolled in Calculus 2 and/or previously taken Calculus 2 at the R1.</td>
</tr>
<tr>
<td>• Full time or Part time student.</td>
</tr>
</tbody>
</table>

In addition, Creswell (2007) recommends recruiting about 8 to 15 participants in phenomenological studies. However, Moustakas (1994) recommends interviewing as many participants until saturation is reached in the interviews. I intended to conduct between 8 to 12 semi-structured interviews. The number of interviews will completely depend on data saturation reached during the interviews. *Data saturation* is a concept used in qualitative research that ensures data does not become repetitive (Saunders, et al., 2018). This type of saturation is different than theoretical saturation, which involves a type of saturation in the grounded data that forms the basis of a theory that explains a phenomenon. Theoretical saturation is typically used in a Grounded Theory research design (Glaser & Strauss, 1967).

Using my revised criteria and obtaining recruitment help from committee members, I was able to schedule 12 interviews with 11 coming to fruition. After reviewing the interviews, I realized one participant did not align with the revised criteria, which is a student that transferred from a R1 into a R1 institution. I conducted 11 semi-structured interviews with 10 completed interviews for
analysis, but one interview was not included in the overall analysis phase. After the 11th interview, I reached data saturation by hearing similar perceptions of the transition experience in Calculus 2. I did not attempt to collect more data after scheduling 12 but only conducting 11 interviews. I felt that my data was saturated at this point of the data collection phase.

**Participants**

The participants were carefully selected based on the criteria. The criteria were ensured by follow up emails after the initial recruitment email was sent. These emails can be found in the Appendices. Each participant was unique in their own way with very interesting experiences as transfer students at the research-intensive institutions. All the participants but one is continuing STEM (Science, Technology, Engineering, Mathematics) majors and planned to continue in this pursuit. Each experience is special and meaningful in the interpretations of this dissertation study. I believe each participant deserves a summary of their experience. Below I summarize each of the participants lived experiences as discussed in the interview and bounded by my protocol.

**Amanda**

Amanda began her academic career at a 4-year non-R1 college in the midwestern region of the United States and had to transfer to a community college due to the COVID pandemic. She really hated mathematics in high school but developed an interest in Physics during her time at the community college. She felt like her Calculus 1 experience at community college was eccentric due to the COVID pandemic and felt that it didn’t prepare her well for Calculus 2, although her Calculus 1 instructor was very supportive. She often felt small and behind in Calculus 2 due to her age and being a transfer student. She supported herself financially by working at a restaurant part time away from campus. She was taking Calculus 2 for a fourth time at the R1, and she continually hears that Calculus 2 is the hardest math class and a “weed out” class. She feels that she is good at
adapting to new transitions and feels optimistic about her future academic studies and very excited about studying Physics. She takes complete responsibility in her successes and failures. Her ultimate goals are to become a surgeon and hopes to study in Europe after her undergraduate studies.

**Andrew**

Andrew started college as a bridge student at a community college that has a transfer agreement with a research-intensive (R1) institution in the southeastern region of the U.S. His family background consists of a lot of mechanical engineers, which is what Andrew planned to major in, but decided to switch to computer engineering. He completed Calculus 1 at the community college and did not have a good experience. Due to the course being online and feeling confused throughout the entirety of the course. He often sought online resources and help from roommates who were also enrolled in the course, but it seemed like everyone in the class was very confused. He did not find the Calculus 1 instructor to be supportive or helpful, but he did find the other students in the class as supportive. He did not feel that the Calculus 1 course prepared him for Calculus 2 at the R1 and was considering withdrawing from Calculus 2 due the fast-paced environment and lack of preparation.

During his time in Calculus 2, he was diagnosed with attention deficit disorder and suffered with depression and anxiety. He relied on his partner for moral and emotional support, and he relied on his father to help with mental health. He feels like the R1 institution had a more supportive environment, but more rigorous and teaches material thoroughly compared to the community college. He feels like to be successful in Calculus 2, he will need to work hard and persevere through. He feels like his transition to the R1 was very intimidating but takes individual responsibility in his success and failure.
Brandon

Brandon started college at a community college and completed Calculus 1 at the community college located in the midwestern region U.S. He found the Calculus 1 experience to be difficult due to it being online because of the COVID pandemic. He did not feel the experience was supportive and did not feel engaged with the instructor. He transferred to an R1 institution and enrolled in Calculus 2 at this institution. He liked Calculus 2 better since it was face-to-face instruction. He felt that support was a crucial component to being successful in Calculus 2. However, he did not feel prepared for Calculus 2 at the R1 because of the fast-paced structure and he felt behind due to being a transfer student. He feels that Calculus 2 is the hardest of the calculus sequence and heard that it is often referred to as a “weed out” class. He had a positive experience in Calculus 2 and felt as though the class was engaging. He felt as though his transition was hard but in a good way. He felt perseverance was an important aspect to being successful in Calculus 2. He thinks it taught him how he can be successful going forward, such as learning how to study.

Brian

Brian started his academic journey at a R1 institution and transferred to another R1 institution due to family reasons. He is the only participant that didn’t qualify for my criteria, but I did not realize this until the interview was being conducted. However, his experience is very interesting and worth discussing due to his contrasting experiences. I will discuss his experience further in the Discussion chapter of this dissertation.

Brian is pursuing a degree in a STEM field and completed Calculus 1 at his prior R1 institution. He felt his Calculus 1 experience was adequate and prepared him well for Calculus 2 at the R1 institution. He did not feel behind or lacking because he is a transfer student, although struggled at the beginning of Calculus 2 but quickly assimilated to the course. He felt very prepared
for Calculus 2 and had a positive experience in his Calculus 2 course. He completed Calculus 2 upon his first experience and was enrolled in Calculus 3 during the time of the interview. He expressed taking full responsibility for his successes and failures.

**Claire**

Claire began her studies at a small faith-based 4-year institution in the southeastern region of the U.S. because of receiving a track scholarship. She started as a biology major and decided to pursue Engineering. She did not feel her transfer institution was very prestigious or focused on academics. She feels a bit insecure in her Calculus 2 class and sometimes feels as though she does not fit in as a transfer student. She did not feel prepared for Calculus 2 but felt more confident as the semester progressed. She finds her Calculus 2 instructor motivating and supportive. She considers herself a hard worker, but often doubts her abilities and feels insecure at the R1 institution because she is a transfer student. She feels her transition in Calculus 2 at the R1 was good but challenging. She feels that support is very important for a successful transition. She wished she had specific concepts to review prior to taking Calculus 2 and feels this would have helped her transition to the course better. She described feeling accountable for her success of lack of success.

**Jake**

Jake started his academic pursuits at a community college in the southeastern region of the U.S. and transferred to a R1 institution in the same region. After transferring, he felt overwhelmed at the R1, but feels welcomed and enjoys the community at the R1. He decided to pursue mechanical or robotic engineering. However, he has considered switching to business but does not want Calculus 2 to be the determining factor of this major switch. He did not feel his Calculus 1 experience prepared him well enough for Calculus 2 and feels behind his peers in Calculus 2 at
the R1. He did not find his Calculus 2 course engaging or supportive from the instructor and found help from tutors as the most effective. He emphasized the necessity of receiving support from provided tutors and supplemental instruction. He had withdrawn from Calculus 2 during the time of the interview and questioning his STEM pursuits. Although, he felt he was completely responsible for his lack of success by not taking advantage of all the forms of support offered by the R1 institution. He was also working part time but seven days a week while taking Calculus 2 and unable to utilize a lot of the campus resources. He described having a lot of optimism about his future academic pursuits and adamant about persevering through Calculus 2.

James

James started higher education at a community college in southeastern region of the U.S. He moved around the U.S. a lot as a child and felt used to adapting to new environments. He completed Calculus 1 at the community college and felt the experience was good even though it was online due to COVID. He found the Calculus 1 instructor supportive and engaging. He belonged to a program that helped with financial needs at the community college and found other means of financial support. He expressed interest in transferring to a R1 institution to pursue computer science but stressed over the cost of attending the R1.

He transferred to a R1 in the southeast and had to take out student loans along with his earned scholarships. This attributed to his stress going into the R1. He did not feel prepared or confident taking Calculus 2 at the R1 and he feels behind and out of his league in Calculus 2 at the R1 compared to his peers. James feels Calculus 2 was very challenging and overwhelming. He joined a religious organization during this time for mental support but found that it was taking up a lot of his study time. He takes responsibility for his successes and failures. He describes the importance of perseverance to help be successful in Calculus 2. During the time of the interview,
James was enrolled in Calculus 2 but had a negative outlook for his final grade. He was considering completing the course at his previous community college, if unsuccessful at the R1.

**Joshua**

Joshua began his studies at a 4-year college in the southeastern region of the U.S. He is a first-generation student and felt behind because of this. He is interested in pursuing a Computer Science degree at the R1. He felt that his 4-year college lacked prestige and rigor and found his Calculus 1 experience to be easy and not challenging, even though it was online. He feels that Calculus 1 did not prepare him for Calculus 2 and feels the Calculus 2 course to be very challenging and faster paced than Calculus 1 at his previous non-R1 4-year college. He feels he is getting a better academic experience at the R1 and feels indifferent towards his social experience at both institutions. He found the transition into Calculus 2 to be overwhelming, but he feels as though he is learning more than he would at his previous 4-year college. He ultimately feels that he is responsible for his successes and failures and highlights the determination to succeed in Computer Science.

**Kay**

Kay is a junior in general engineering with hopes to continue pursuing Civil Engineering at her current R1 institution in the southeastern region of the U.S. She began her college career at a community college and completed Calculus 1 at this institution. She felt like her Calculus 1 experience was good and her overall experience at the community college as good. However, she did not feel her Calculus 1 adequately prepared her for Calculus 2. She transferred to a R1 institution close to the community college due to economic reasons. During the interview, she was enrolled in Calculus 2 at the R1 institution. She did not feel prepared for Calculus 2 and feels the course was overwhelming due to its fast-paced environment. She has recently met someone in
Calculus 2 and feels that this relationship is consuming more of her time as she is devoting more energy towards her social environment as opposed to her academic environment. She takes full responsibility for her success and lack of success in Calculus 2. She does not feel engaged in Calculus 2 and describes the importance of relying on support opportunities, which she did not completely utilize. She hopes to continue at the R1 to complete her Civil Engineering degree.

**Lauren**

Lauren had withdrawn from Calculus 2 due to lack of preparation and feeling overwhelming despair at the time of the interview. She began her studies at a community college in the southeast and completed Calculus 1 at the community college. She utilized the on-campus tutoring center a lot during Calculus 1. Her family background is in engineering, and she was planning to pursue engineering as a career. Having a family of engineers proved to influence her goals for pursuing a STEM career.

When she transferred into the R1, she felt very lost and had a difficult time navigating around campus and using academic resources on campus. She had a negative experience with her Calculus 2 instructor. She felt as though he was unprepared and not a thorough teacher. On the first day, he gave her an exam that she did not know how to do and felt very judged by the teacher. She ended up dropping Calculus 2 within her first two weeks of the fall semester. As a transfer student, she viewed herself as small and felt very behind her peers. She had to take a course for transfer students which she found very helpful. She thinks the R1 should make more of an effort to prepare transfer students, such as showing them around campus or having a Calculus review packet. She expressed the need for academic and social support. She noted that the university advised her not to take Calculus 2 at the R1 but decided to do so due to economic reasons. However, Lauren did ultimately take responsibility for her lack of success in Calculus 2 and
realized the course revealed her true lack of interest in STEM. The only reason she wanted to pursue STEM was due to her family background of engineers. Lauren decided to change her major to Business after her epiphany in Calculus 2. Additionally, she did not align well with her roommates and expressed indignation towards them.

**Mary**

Mary is the only dual enrollment student for this dissertation study as opposed to the pilot study. She began her college career as a high school student enrolling in college courses at a community college near her high school. She completed Calculus 1 at the community college in the midwestern region of the U.S. She is an open engineering major and undecided for the field of engineering. During the time of the interview, she was enrolled in Calculus 2 for the second time at the R1. She had previously taken Calculus 2 at the R1 and failed the course.

Mary described her Calculus 1 experience as good and felt positive about leaving Calculus 1. However, when she transferred to the R1, she felt unprepared for Calculus 2 due to the fast pace and was overwhelmed with the content. Additionally, she encountered a lot of negative social experiences with roommates which contributed to her anxiety. She feels the Calculus 2 course was engaging and found office hours to be the most useful and supportive. While taking Calculus 2, she expressed the importance of relying on provided support for persistence. She describes being responsible for her success and lack of success in Calculus 2. Lastly, she feels that the only way to successfully complete Calculus 2 is through perseverance and hard work.

**Participant Summary**

For the participants of this study, 7 out of the 11 participants were enrolled in Calculus 2 during the time of interviews. Those participants were: Joshua, Amanda, Mary, Kay, Claire, Andrew, and James. The 4 participants not enrolled in Calculus 2 at the time of the interviews
were Brandon, Jake, Lauren, and Brian. Both Brandon and Brian had successfully completed Calculus 2 at the time of the interviews. Both Jake and Lauren had been enrolled in Calculus 2 but had withdrawn at the time of the interview. The themes that emerged in the data analysis resulted in the perceptions of the participants enrolled in Calculus 2 and reflections from the participants that were not enrolled in Calculus 2 at the time of the interview.

In fact, my intention was to interpret the lived experiences of the participants with the alignment of my research questions. The following Table 5 illustrates the data collection aligned with my research questions. However, the research questions were addressed through the themes that emerged by my interpretations of all participants within the aligned data collection. This occurred due to the timeline of collecting the data. The data was collected during April of the Spring semester of the year 2022. Therefore, all participants were asked questions about their reflection of their transition and how do they perceive their transition. I analyzed the data from the perspective that the participants reflected on their lived experiences and to the best of their ability, provided an interpretation of their perception and sense making of their transition experience. The results highlight all the participants perceptions, sense making, reflection and understanding of their transition experience in Calculus 2 at a R1 institution. However, I think it is important to see the original intention of approaching the methods for addressing the research questions.

**Table 5 – Intended Data Collection Aligned with Research Questions**

<table>
<thead>
<tr>
<th>Data Collection – Aligned with Research questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: How do transfer students perceive and make sense of their transition experience in Calculus 2 at a research-intensive institution?</td>
</tr>
</tbody>
</table>
RQ2: How do transfer students reflect on and understand their transition experience?

1. Reflection of Transition - Participants who completed or not enrolled in Calculus 2: Brandon, Brian, Jake, and Lauren

RQ3: To what do they attribute to their success and/or lack of during the transition experience?

1. Attribute Success or Lack of Success – Participants enrolled and not enrolled in Calculus 2: All Participants

5.5 Data Collection – Semi-Structured Interviews

Phenomenological studies can collect any type of qualitative data that exhibits the individuals’ interactions with the phenomenon and their lived experiences (Moustakas, 1994; Creswell, 2007). Given the nature of this dissertation study, I decided to collect one-on-one semi-structured interviews to explore transfer students’ perceptions of the phenomenon of transition in Calculus 2. Semi-structured interviews are where the researcher have predefined questions or topics and probes further as the participant responds, which can produce a powerful data set that provide insights into the participants' experiences, perceptions, or opinions (Peters & Halcomb, 2015).

I interviewed all participants through Zoom and each participant gave consent on the recording of these interviews. I recorded the interview using the record feature on Zoom and I used a backup voice recording application to enhance any technical issues that might arise. The interviews were then transcribed verbatim using the Zoom transcript and cleaned by redacting any
verifiable information to protect the anonymity of the participants and their locations. During the interview, I asked participants to choose their own pseudonyms, which helped build rapport for the interview and mitigate any bias I might impart on the student’s identities. The interview protocol used involved carefully constructed questions using the conceptual framework, pilot study results, and research questions.

**Interview Protocol**

I opened the interview with rapport building questions focused on the individual to have them open up about themselves before exploring their perceptions more in-depth. Research suggests that building rapport in interviews builds trust with the interviewee and increases comfort for participants to provide deeper insight into their experiences and perceptions of the phenomenon (Abbe & Brandon, 2014). I carefully constructed open-ended questions guided by my research questions, education research literature, and my conceptual framework to investigate transfer students’ perceptions of their transition in Calculus 2. Furthermore, follow up questions were asked if any ambiguity appeared in my understanding to strengthen the communicative validity of my interpretations and to help mitigate my bias towards their responses (Walther & Sochacka, 2014).

The interviews were projected to last between 60 minutes to 120 minutes with an average of about 90 minutes per interview. The participants received a $25 Amazon Gift Card after the interviews were completed to compensate for their time. To enhance validity and reliability for the data collection, each participant was sent a cleaned transcript to review prior to analysis to ensure their consent for usage of their perceptions in the reporting of this dissertation. Analysis did not start on the transcripts until confirmation emails were received by the participants. Any identifiable information was completely redacted for this study. Names were changed using pseudonyms picked by the participants.
For crucial importance in qualitative research, conducting pilot studies for interview protocols is an integral aspect for refining interview protocols and testing conceptual frameworks (Pfirman, 2018). It is useful in the process of conducting qualitative research as it highlights the improvisations and revisions to aspects of the larger research design (Majid et al., 2017). As discussed in Chapter 3, my pilot study helped refine the questions for the interview protocol. I used constructs of the conceptual framework along with my research questions, pilot study results, and education research literature, in particular questions highlighted by Lazarowicz (2015) to help me construct the interview protocol questions (Schlossberg et al., 2022, 1995, 1984; Lazarowicz, 2015; Pendleton, 2007). Below in Table 6, I show the alignment between constructs of my conceptual framework and the research questions guiding this dissertation with the questions I presented during my interviews (Pfirman, 2018; Schlossberg et al., 2022). Noting, the follow up questions are not presented in the table below since these were only asked if I experienced any ambiguity. The follow up questions were an important mechanism I used to enhance communicative validity (Walther et al., 2013). Please see the Appendices for the complete interview protocol used including all questions and introductions.

**Table 6 - Interview Protocol Aligned with Conceptual Framework & Intention**

<table>
<thead>
<tr>
<th>Interview Protocol Questions</th>
<th>Theoretical Constructs &amp; Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How is your day going?</td>
<td>Build Rapport and Gain Trust</td>
</tr>
<tr>
<td>2. Tell me a bit about yourself?</td>
<td></td>
</tr>
<tr>
<td>3. Would you like to choose your own pseudonym?</td>
<td></td>
</tr>
<tr>
<td>1. Can you describe your previous college you transferred from?</td>
<td>Moving In - Approaching Transition</td>
</tr>
<tr>
<td>2. Can you describe your Calculus background leading up to your transfer decision?</td>
<td>Goal Commitments</td>
</tr>
<tr>
<td>3. Overall, how did you feel about your Calculus 1 experience at your previous institution?</td>
<td>Maintaining Trust</td>
</tr>
<tr>
<td>4. Can you tell me why you decided to transfer to the R1?</td>
<td></td>
</tr>
</tbody>
</table>
5. Describe your goals you have transferring into the R1?

<table>
<thead>
<tr>
<th>1. What is your major?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 How did you decide on this major?</td>
</tr>
<tr>
<td>1.2 What math courses do you need for this major?</td>
</tr>
<tr>
<td>2. What resources, traits, or strengths do you have that will contribute to a successful transition into Calculus 2?</td>
</tr>
<tr>
<td>3. Can you describe how you view yourself as a transfer student in Calculus 2 at the R1?</td>
</tr>
<tr>
<td>4. Describe how your teaching modality is affecting your transition into Calculus 2 at the R1?</td>
</tr>
<tr>
<td>5. Describe how things are going for you this semester.</td>
</tr>
<tr>
<td>6. How are things going for you in your Calculus 2 course?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I. Describe any supports or resources you are involved with this semester.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Have you received any support in Calculus 2? Tell me more about that.</td>
</tr>
<tr>
<td>3. Can you describe any academic supports you sought this semester while taking Calculus 2 at the R1?</td>
</tr>
<tr>
<td>4. Can you describe any non-academic supports you sought this semester while taking Calculus 2 at the R1?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I. What things or strategies are helping you be successful in Calculus 2 this semester?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Describe any strategies that are helping you in Calculus 2.</td>
</tr>
<tr>
<td>3. Describe any strategies that are not helping you in Calculus 2.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I. Describe how your Calculus 1 experience is affecting your experience into Calculus 2 now.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Can you describe any positive or negative feelings you have regarding any resources you are experiencing in Calculus 2?</td>
</tr>
<tr>
<td>3. Can you please describe your transition experience from Calculus 1 at to Calculus 2 at the R1?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Moving Through – Self/Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving Through – Self/Situation</td>
</tr>
<tr>
<td>Moving Through – Support</td>
</tr>
<tr>
<td>Moving Through – Strategies</td>
</tr>
<tr>
<td>Moving Through – Academic and Social Systems (Taking Stock of 4 S’s)</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
</tbody>
</table>

| 1. | How do you perceive and make sense of your transition into Calculus 2 at the R1? |
| 2. | Describe how you reflect and understand your transition experience in Calculus 2. |
| 3. | Explain what you attribute your success or lack of during your transition in Calculus 2 at the R1. |

### Research Questions

**Phenomenological research designs do not usually present a method or technique of analysis to use on the collected data (Creswell, 2007, 2012). Interpretive Phenomenological Analysis (IPA) has set out to provide structure in analytical methods for phenomenology. However, for this dissertation, I did not employ pure IPA, but aspects of psychological phenomenology. Creswell (2007), van Manen (1990), & Moustakas (1994) only entail the importance of identifying significant statements that capture the essence of the phenomenon under investigation and provide rich descriptions of these statements and the phenomenon. The main reason IPA was not used is because it is considered an “bottom up” analysis. This entails approaching the data without any predefined theories or codes and beginning the analysis from a holistic open coding technique, which aligns with philosophical aspects of pure phenomenology, that is approaching the data from a “pure” approach. My approach to the analysis involved using...**

---

5.6 Analysis
predefined codes as I approached the data. Which technically would violate the usage of a “pure” Interpretive Phenomenological Analysis, but my philosophical perspective is certainly aligned well with foundations of IPA.

Approaching this phase of my dissertation, I consulted with committee members for advice as I begin to analyze my data. During my time as a graduate research assistant, I gained experience using a priori and emergent coding as analytical tools to analyze qualitative interview data. Our discussions encouraged me to continue using the techniques I felt most comfortable with. Coding is a powerful qualitative tool used for pulling statements, words, and sentences out of the interview transcript and attributing to those selected bits of spoken words a phrase, category, or other demarcation to organize and sort data in a meaningful way that is consistent with guiding theories or research questions (Saldaña, 2016). Using coding as an analytical tool became quite apparent as I approached the data, but the types of coding to use were ambiguous. Other phenomenological and grounded theory studies have used a form of the “Trinity” method, that is, three cycles of coding starting with open, axial, and selective coding (Lazorowitz, 2015; Hicks, 2014). Since choosing a coding technique is not bounded by the research methodology, I decided based on committee member discussions to use a priori and emergent coding during my first coding cycle. With the trinity method in mind along with aspects of grounded theory analysis, I then relied on concepts of axial and selective coding during the second coding cycle to seek the emergent themes. In the following sections, I describe my careful steps for organizing, transcribing, and analyzing the data with examples of the organization and coding to ensure clarity for the reader.

**Transcript Organization**

Prior to coding, the cleaned interview transcripts were organized in an Excel file using the constructs of the conceptual framework and research questions. I organized the transcripts by
placing each participants responses corresponding with the interview protocol questions into five pages in the Excel file. Each page was identified by the structure of the interview protocol. I aligned the structure of the interview protocol to aspects of my conceptual framework. The Excel file pages are organized as the following:

1. Q1 – Build Rapport & Gain Trust
2. Q2 – Transfer Experience – Moving In
3. Q3 – Transition Experience – Moving Through
4. Q4 – Research Questions
5. Q5 – Conclusions – Ending statements or questions.

Each page contained the interview protocol questions corresponding with the bolded groups and the participants responses to those questions. The participants were assigned a color to further help the organization into the cells. This organization gave my analytical approach structure as opposed to viewing the interviews as separate entities. The purpose of doing this organization is to help the analysis reveal the perceptions of the transition guided by the transition conceptual framework and to seek the emerging themes as patterns or categories that reveal in the groupings (Miles, Huberman, & Saldaña, 2020). The following Figure 6 shows how the data was organized in Excel.
With the supervision of my advisor, I teamed with one undergraduate research intern to perform the coding. This teaming helped to analyze my data to mitigate any bias and expose my analysis to scrutiny and constructive criticism. Furthermore, this teaming helped with my interpretations of the results that emerged in the data. Qualitative research is often criticized for validity and reliability due to its empirical methods and researcher interpretations. For this reason, it is recommended to have other trained qualitative researchers help with the analysis (Saldaña, 2016).

I recruited an undergraduate research intern that I trained in qualitative coding for a few weeks prior to analyzing the data. The intern was provided with coding resources and examples of the different types of coding. I worked closely with the intern during the cleaning of the interview transcripts, reading through the transcripts prior to coding, construction of *a priori* codes and writing analytical memos during the coding process. Additionally, I mentored the intern prior, during and after the analysis of the data for bracketing purposes to not only mitigate my own bias.
but to ensure the intern self-reflected on their own bias about transfer students and their transition in Calculus 2. The intern completed bracketing prompts and included journaling in their analytical memos to highlight any bias that might’ve emerged during the analysis. My own bracketing prompts used during this reflective process can be found in the Appendices.

**First Cycle Coding**

An *a priori* coding approach implies that the researcher has a set of predetermined codes, either from a guiding theoretical or conceptual framework, from the guidance of research questions, from a previous study or pilot study, or from the analysis of quantitative data or mixed-methods data (Stuckey, 2015). This coding technique is limiting, but useful when a research design is being guided by a conceptual framework (Creswell, 2013). This choice of coding was decided for use based on my comfort level, discussions with committee members, and using the guides of my conceptual framework and research questions. It cannot be denied that other codes might emerge during the analysis even using predefined code. For this reason, I combined the use of *a priori* with emergent coding. Emergent codes “emerge” in the analysis that are not predefined or predetermined prior to the analysis and may be specific words from participants’ own voices, or they may be concepts which you as a researcher have been sensitized to in the process of preparing for the research (Elliot, 2018). The following Figure 7 shows excerpts from the data coded in Excel using predetermined *a priori* codes to give the reader a sense of how the coding was organized and conducted in Excel.

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Response</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jake</td>
<td>Jake: I would say, I’ve known for a long time, what I wanted to do, which was robotics engineering or mechanical engineering, and so, University B, being in State B is known for the engineering department, is known for engineering, and so I had my eyes on University B for a while now going through college. I felt like that's what, I had that mentality, where, if I know I'm going to or if I believe I want to be somewhere myself, then things will align for that to happen, and I tell myself that I was going to go to University B and become a kind of engineer. And so far, everything that I wanted to do in life is going on the right track. It's not easy, but I'm trying to make it happen.</td>
<td>1.1 Anticipated Transition</td>
</tr>
</tbody>
</table>
Furthermore, Creswell (2013) notes that researchers that hold a deep philosophical connection and commitment to qualitative inquiry tend to prefer the use of *a priori* and emergent codes. *A priori* and Emergent coding techniques philosophically align with my positionality, radical constructivism, and interpretivist approach to analyzing the data. This reflective realization provided another confirming reason for employing both *a priori* and emergent first cycle coding techniques for the analysis phase of my study. The following Table 7 shows *a priori* codes that were predefined with the alignment of my conceptual framework and *emergent* codes that emerged during the analysis with a theoretical connection. Appendix F contains a complete list of the first cycle *a priori* and emergent codes aligned within the phases of my conceptual framework. The alignment follows directly from my codebook used during the first cycle analysis of the data.

**Table 7 - A priori & Emergent Codes Aligned with Conceptual Framework**

<table>
<thead>
<tr>
<th>A priori Codes</th>
<th>Emergent Codes</th>
<th>Theoretical Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Personal Attributes</td>
<td>1. Positive Experience in Calc 1</td>
<td>Moving In – Approaching Transition</td>
</tr>
<tr>
<td>2. Family Background</td>
<td>2. Felt Confident Leaving Calc 1</td>
<td></td>
</tr>
<tr>
<td>2. Strategies in Calc 2</td>
<td>2. Fast-paced Calc 2</td>
<td></td>
</tr>
<tr>
<td>1. Goals after Calc 2</td>
<td>1. Perseverance in Calc 2</td>
<td>Moving Out – Utilizing all resources for positive/negative transition</td>
</tr>
<tr>
<td>2. Positive/Negative Experience</td>
<td>2. “Did my best”</td>
<td></td>
</tr>
</tbody>
</table>

In summary, the codes presented in the table represent a very small cohort of the codes that emerged and were predefined for the analysis of this study. Some of the emergent codes were descriptive in essence and in vivo codes, or “in the words of the participant” (Saldaña, 2016). After the first cycle of coding, a total of 126 codes (Appendix F) were developed either *a priori* or emerged in the analysis. With the large list of codes, my coding team and I began to sort and combine codes to prepare for a second cycle.
**Second Cycle Coding**

After a deep careful analysis using the first cycle coding, we discovered a daunting list of 126 codes organized in excel framed by constructs of the guiding conceptual framework. We began sorting and combining the codes in excel and attempted to organize the codes into overarching categories that developed through the patterns emergent in the codes. However, this endeavor proved very time consuming and not beneficial in Excel. Therefore, I decided to utilize a qualitative data analysis software to assist in this phase of the data analysis. Fortunately, I obtained a two-year license for NVivo 13 Pro Software, which is a qualitative research analysis software that is widely accepted as an analytical tool in qualitative research.

NVivo 13 Pro Software was used to help categorize the list of 126 codes and provide more structure for a second cycle of coding. The software provided quantitative aspects of the qualitative data and implied certain emergent patterns in the codes that influenced our discussions to reduce the list to 30 categories prior to second cycle coding. This process included combining codes and removing codes that were only used once in the analysis. The second cycle of coding didn’t use one technique, as we used elements of axial coding and selective coding to identify specific statements from the interview data, which is important in phenomenological studies. We then clustered the codes into categories and subthemes to identify patterns to seek emerging themes. Axial coding is used to reassemble the “fractured” data during the first cycle into a categorized manner and help provide meaning and relations between categories and subthemes (Saldaña, 2016). Selective coding tends to rely on axial as a transition between first cycle to thematic emergence with identified statements in the data (Saldaña, 2016). The following Figure 8 depicts a hierarchy concept map that provides my interpretation of the data to the emergent theme with codes, categories, and subthemes as building structures of the overarching emergent theme.
Additionally, I indicate my interpretations of the coding cycles as a hierarchy that contributed to seeking the emergent theme. The data was organized as previously described. The Code construct refers to the first cycle codes, which were *a priori* and emergent. The Subtheme and Category constructs were revealed during the axial phase, which contributed to the selective phase that revealed the overarching theme.

![Figure 8 - Emergent Theme Concept Map Depiction](image)

The subthemes and categories were used as properties of the overarching themes to provide theoretical structure to the meaning of the emergent theme. The clustered categories were used to extract the emergent themes through my interpretations. Some of the clusters formed subthemes as inherent structures of the emergent theme. The interpretations were discussed in the coding team and included during the reflexive process of bracketing to mitigate bias about the themes. The themes were then identified through my interpretations. Descriptions of the themes along with subthemes and specific quotations to help support the themes are discussed in Chapter 6 of this dissertation.
5.7 Validity & Reliability

I now discuss the methods I used to ensure the trustworthiness, validity, and reliability of this dissertation study. To ensure validity and reliability for this research, I employed the use of the Qualifying Quality in Qualitative ($Q^3$) Research Framework to guide the design of this research study (Walther & Sochacka, 2014). The framework is used to qualify the quality of the qualitative data by providing quality procedures during the process of “making the data” and “handling the data” as depicted by Walther and Colleagues (2013) in Figure 9 (Walther et al., pg. 639, 2013).

Making the data refers to the research process through the data collection procedures, which this study collected semi-structured interviews as data. Handling the data refers to how the data is organized, analyzed, and disseminated, which I discussed in the previous sections. The concepts are important when conducting qualitative research because qualitative data is sensitive to manipulations and subject to researcher interpretations. During this study, I adhered to the best of my ability to following the structures of the $Q^3$ framework to ensure the methods in this study and the results of this study align completely with trustworthiness.

![Figure 9 - Quality Management Model of Research Process](image-url)
Furthermore, the quality framework draws together concepts from the broad intellectual and philosophical traditions of interpretive research (Walther & Sochacka, 2014). It develops them into a systematic, process-oriented understanding of the research quality along with two dimensions (Walther et al., 2013). According to Huff and Colleagues the $Q^3$ framework is, “a process model, which locates the quality strategies throughout the research process, and a typology, which systemizes fundamental aspects of validation and the concepts of process reliability to explicate quality strategies in their fundamental contribution to substantiating the results or claims as findings of the research study” (Huff et al., pg. 2, 2015; Walther et al., 2013). This framework is widely accepted in qualitative research. Moreover, the framework has been used extensively in STEM education research to employ qualitative methods. The following Table 8 depicts the definitions used for the aspects of validation and process reliability taken directly from Walther et al. (2013, 2014).

**Table 8 - $Q^3$ Framework for Quality in Qualitative Research**

<table>
<thead>
<tr>
<th>Type</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Validity</td>
<td>Concerned with the fit between the social reality under investigation and the theory generated.</td>
</tr>
<tr>
<td>Procedural Validity</td>
<td>Concerned with features of the research design that inherently improve the fit between the reality studied and the theory generated.</td>
</tr>
<tr>
<td>Communicative Validity</td>
<td>Concerned with the integrity of the co-construction of the knowledge in the social reality under investigation and within the research communities.</td>
</tr>
<tr>
<td>Pragmatic Validity</td>
<td>Concerned with the theoretical constructs and their compatibility with the empirical reality.</td>
</tr>
<tr>
<td>Ethical Validity</td>
<td>Concerned with aspects of integrity and responsibility throughout the entire research process.</td>
</tr>
<tr>
<td>Process Reliability</td>
<td>Concerned with the mitigation of random influences on the entire research process.</td>
</tr>
</tbody>
</table>
Theoretical Validation

I used theoretical validation from the framework to ensure the social reality, that is, transfer student’s perceptions of their transition in Calculus 2 are exposed through the research process. My intention is to follow the procedures as outlined in the discussion of phenomenological methods, which is to provide a rich description of their perceptions. This intention led to my careful construction of my interview protocol questions with the conceptual framework as my theoretical guide and utilizing philosophical coding techniques, a priori and emergent coding, grounded in the analysis of the data. These careful steps are aligned with the validity measure of theoretical validation.

Procedural Validity

Procedural validity focuses on the methods and techniques used in the entire research design to ensure the social reality is properly investigated (Walther et al., 2013). This was achieved mainly by my careful construction of interview protocol questions from my pilot study and constructs of the conceptual framework. These questions ensured that I investigated the transition as a social reality. Moreover, to ensure I investigated the essence of the social reality, I used bracketing throughout the entire research process. My entire coding team bracketed before, during, and after the analysis of the data to mitigate any threats or bias we might have about the participants’ perceptions of their transition as the social reality. See Appendices for bracketing prompts used by myself and other members of the coding team. Although I used a guiding conceptual framework that contains a theoretical foundation of the social reality under investigation, I bracketed my understanding of the theories to truly analyze the data to reveal the participants’ perceptions of their transition, this is to provide strength to using phenomenological methods too.
Communicative Validity

Communicative validity is concerned with the co-construction of participants’ meanings and perceptions of their social reality on their own terms. To ensure communicative validity, I asked several follow up questions during the interview to make sure of my own understanding and interpretations of their responses. Additionally, during the usage of emergent coding, some codes that emerged were *in vivo* codes or codes that were the participants’ own words. Prior to in-depth analysis of the interview data, I sent each cleaned transcript of the interview to the participants to ensure their words were not manipulated in any way and to represent their views in the most accurate form. Furthermore, after each interview, a summary for each participant’s interview was constructed by the coding team and based on our own interpretation of the interview. Each summary was sent to the participants along with their cleaned transcripts to ensure they are accurately represented for validity of the interpretation of the interviews.

Pragmatic Validity

Pragmatic validity is used to ensure the theories brought to the study are compatible with the social reality under investigation. For making the data, I used pragmatic validity to determine if the conceptual framework I brought to guide this study survived the social reality. Are the combined theories of Schlossberg and Tinto compatible with the social reality that my participants experienced, that is the transition they experienced? The conceptual framework with the combined theories of Schlossberg and Tinto guided my interview protocol development and grounded in the development of a priori coding. Moreover, the purpose of my pilot study was to ensure pragmatic validity by piloting the conceptual framework and refining the interview protocol.
Ethical Validity

I used ethical validity to protect the participants of this study and to ensure my own interpretations were for the utmost advocacy for my participants. Every participant is anonymous with their chosen pseudonyms and their institutions have been redacted to further protect their anonymity. Furthermore, having a coding team during the analysis of this study helped ensure ethical validations by keeping my interpretations of the data bias free and keeping discussions aligned with providing awareness and justice for the lived experiences of my participants.

Process Reliability

Process reliability is concerned with the mitigation of random influences on the entire research process (Anderson & Martin, 2017). To help with the mitigation of random influences, perpetual bracketing within my coding team and I were conducted during the phases of making the data, handling the data, and interpreting the data. This constant bracketing allowed me to revisit my own positionality as we as the positionality of my coding team to ensure the mitigation of any preconceived and random bias we might have. During the analysis phase to ensure rigor and reliability of the coding, we used inter-rater reliability to calculate a reliability percentage of at least 80% by relying on the number of cells in our Excel page that include the agreed and disagreed codes (Armstrong et al., 1997). The formula used to calculate the percentage is the following:  \[ R = \frac{A}{T} \times 100 \], R is the reliability, A is the total number of agreed upon cells, and T is the total number of cells that contain data and codes. Moreover, we considered the coding reliable if \( R \geq 80\% \) and unreliable if \( R < 80\% \). We did not experience any unreliability during our team coding efforts.
5.8 Conclusion

This chapter focused on the methods used in this dissertation study to address my guiding research questions. I discussed my overall justification for using phenomenological methods and my analytical techniques used to reveal the emergent themes as theoretical structures that constitute the essence of the phenomenon explored in this study. Additionally, I highlighted the careful use of the $Q^3$ Framework to ensure quality and reliability in my overall handling of the data, making the data and analyzing the data. In the next Chapter, I will discuss the emergent themes and subthemes as results of this study. I will address the research questions from the perspective of the emergent themes and subthemes. Moreover, I will discuss my interpretations of my results with the underlying Conceptual Framework that guided my study theoretically and provide a conclusion discussing my interpretations.
Chapter 6

Results & Findings

The purpose of this study was to understand how transfer students perceive their transition experience in Calculus 2 at a R1 institution. No studies have been conducted to date to qualitatively explore transfer student’s transition experience in Calculus 2. This study has provided a lens to begin understanding transfer students in Calculus 2 at a R1 institution. The analysis of the interview transcripts with the transfer students that participated in this study generated the essence of their perceptions of the transition experience into Calculus 2. Four themes constituted the essence; Feels Unprepared for Calculus 2, Support is Necessary for Persistence (in Calculus 2), Perseverance Matters (in Calculus 2), and Takes Individual Responsibility (for success or lack of success).

The themes will be described below and exemplified by sub-themes and significant quotations that support the essence of the themes/sub-themes. Additionally, I provide concept maps of each theme that represent the structures that build the emergent themes through the codes, categories, and subtheme in the Appendices. Several quotations are provided to strengthen the theme by showing not only one participant, but several of the participants statements align with the core of the emergent theme. After discussing the emergent themes, I will show my interpretations of how the themes and subthemes align with the guiding conceptual framework and I will address the research questions in context with the emergent themes as descriptive answers. I will then conclude the chapter by providing further interpretive findings from deeper aspects that were revealed through the emergent themes. The following Table 9 recalls information about the participants that were interviewed for this dissertation research.
Table 9 - Participant Information

<table>
<thead>
<tr>
<th>Name</th>
<th>Transfer Institution</th>
<th>Current Institution</th>
<th>Enrolled in Calculus 2</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amanda</td>
<td>R2</td>
<td>R1 - Midwest</td>
<td>Yes</td>
<td>Physics</td>
</tr>
<tr>
<td>Andrew</td>
<td>Community College</td>
<td>R1 - Southeast</td>
<td>Yes</td>
<td>Computer Engineering</td>
</tr>
<tr>
<td>Brandon</td>
<td>Community College</td>
<td>R1 - Midwest</td>
<td>No</td>
<td>Environmental Engineering</td>
</tr>
<tr>
<td>Brian</td>
<td>R1 - Midwest</td>
<td>R1 - Southeast</td>
<td>No</td>
<td>Meteorology</td>
</tr>
<tr>
<td>Claire</td>
<td>Non-R1 4-Year College</td>
<td>R1 - Southeast</td>
<td>Yes</td>
<td>Biosystems Engineering</td>
</tr>
<tr>
<td>Jake</td>
<td>Non-R1 4-Year College</td>
<td>R1 - Southeast</td>
<td>No</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>James</td>
<td>Community College</td>
<td>R1 - Southeast</td>
<td>Yes</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Joshua</td>
<td>Non-R1 4-Year College</td>
<td>R1 - Southeast</td>
<td>Yes</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Kay</td>
<td>Community College</td>
<td>R1 - Southeast</td>
<td>Yes</td>
<td>Civil Engineering</td>
</tr>
<tr>
<td>Lauren</td>
<td>Community College</td>
<td>R1 - Southeast</td>
<td>No</td>
<td>Civil Engineering (Changed to Business After Calculus 2)</td>
</tr>
<tr>
<td>Mary</td>
<td>Community College (Dual Enrollment)</td>
<td>R1 - Midwest</td>
<td>Yes</td>
<td>Engineering (Undeclared)</td>
</tr>
</tbody>
</table>

Results – Emergent Themes

6.1 Theme 1 – Feels Unprepared for Calculus 2

The participants in my study have transferred to an R1 institution to enhance their chances of pursuing a career in STEM. They quickly realized while in their Calculus 2 course that they were not prepared for Calculus at the R1. One of the overarching themes that emerged throughout 10 of the 11 interviews were that the participants did not feel prepared for Calculus 2 at the R1 due to feeling behind, faster pace in Calculus 2, doubting abilities in Calculus, lack of Calculus 1 preparation, feeling insignificant as a transfer student, feeling unsure about self in Calculus
2, having a difficult time with content and negative experience with teaching modality. This theme emerged as a result from the participants who were enrolled in Calculus 2 and as reflection from the participants who were not enrolled in Calculus 2 at the time of the interviews. There are several reasons for this feeling of inadequate preparedness in Calculus 2. I will discuss several of the participants perceptions. Lauren reflected on her first day in Calculus 2 after she transferred to the R1 from a community college, where she completed her Calculus 1 course.

“I do not feel I was adequately prepared for Calc 2. Yeah, and especially that first day experience it was, he said, you should already know this and I'm looking at it and I'm like well why don't I know it. Was I never taught integrals or did I just not understand them. And most of the questions I could have almost sworn I never seen them before, some of the integrals I had seen them, but I didn't quite remember how to do them. But most of the questions that just felt like I was not prepared at all.” (Lauren)

Many of the participants described their experience in Calculus 2 as faster paced and the content seemed much harder compared to Calculus 1. Kay described her experience as trying to keep up with notes but not understanding what she was writing. Kay emphasized the faster pace compared to her Calculus 1 experience.

“Well, I was able to get the video recording from the class so I can go back over, but it is different because it's much faster than calc 1. So, I was trying to rush and take notes and didn’t understand what I was writing because I wasn’t able to hear anything that she said while writing everything down.” (Kay)

Moreover, Amanda described the complexity of experiencing the content in Calculus 2 that requires visually understanding the graph of functions and revolving the regions bounded by the graph about the axis to find the volume of a solid generated by this rotation. She discussed the difficulty of seeing the patterns that justify solutions. She described an intense feeling of being behind due to the complexity of the content. These complexities in content evoked feelings of being overwhelmed with the content and underprepared in her prerequisite abilities.
“Overall, it’s very conceptually challenging even with solids of revolution and finding volume of those I mean it looks like just functions, but you have to imagine in your mind that function moving around an axis and creating this volume that you can integrate like that it’s very difficult thing to grasp in your head is like okay what am I even actually solving for here, let alone what how do I know the patterns of like how to make this happen.” (Amanda)

Along with the challenging content and faster pace of Calculus 2, transfer students at the R1 have other social and academic aspects that affect their performance in the classroom. Many of the participants described feelings of being behind, feeling small, and feeling inadequate compared to their peers because they completed Calculus 1 elsewhere.

Sub-Theme 1.1: Feeling Insignificant as a Transfer Student

For this sub-theme, I will focus on a few of the participants who expressed feelings of being behind and feeling insignificant as a transfer student. The sub-theme emerged because of interpreting codes that exemplified mental health, feeling unconfident being a transfer student, feeling unsure about self in Calculus 2, and having doubt about abilities in Calculus 2. Claire describes insecurities she felt as a transfer student in Calculus 2 due to feeling lost in class and feeling like her peers are completely understanding the lecture.

“Okay. Oh, this is pretty interesting actually. It does kind of feel like I don't fit in compared to everybody else, because everyone else took calc one here I believe so, like, I feel like very insecure sometimes when I'm in class and we're learning new things because I'm like oh I don't really know what's going on, but all the other kids seem to know what’s going on. And that might not be necessarily true it's probably just like my insecurities that I didn't take the first calc here so it's probably not true, but the same time, I do feel a little bit under prepared than everybody else.” (Claire)

Jake shares a similar sentiment as Claire but seemed optimistic about the R1 given the resources and tools available for him to succeed. He exemplifies feeling unprepared and behind compared to the other students.

“Well, if you were if compared to others, I would definitely say, lacking. I felt unprepared or behind. But that didn't stop me from trying everything I could to,
especially when all the tools and resources here to try to get myself caught up to that level.” (Jake)

Andrew did not share the optimism of Jake’s viewpoint on the R1, as Andrew *feels overwhelmed and alone during his Calculus 2 experience*. Andrew mostly discusses *feeling underprepared by the previous community college due to the inferior teaching style, feeling alone at the R1* and approaching Calculus 2 with the detrimental rumor that Calculus 2 is a “weed out” class at the R1 and expresses wishes of completing Calculus 2 at the community college even though he feels it is inferior at the community college.

“From what I've heard like calc two is kind of viewed as a weed out class at R1 University, and I was kind of disappointed that I couldn't get it over with at Community College because from what I've you know where I am now it did seem a little bit lighter on the course load, since I didn't establish those foundational skills, I was behind from the get go and I was definitely just held back and I didn't really know where to start because I felt like I didn't know anything, even though I did know some things but there are just too many gaps in my memory so the teaching style must have been inferior at Community College, because I feel like I was more on my own here in R1 University and... trying to think... I hope that somewhat answers your question.” (Andrew)

Amanda describes her experience with Calculus 2 during the COVID pandemic when the course was being taught using asynchronous videos and how this had a negative effect on how she felt as a transfer student at the R1. She *describes not feeling like a “real student” and having feelings of being “small” and even like a “speck of dust”*. However, she finds optimism during this period realizing the need for further motivation.

“And that was when it was asynchronous videos. I did not do well in that, but I was also invested in my job at the time and could not mentally prioritize school being online and part time. It just was difficult for me to feel like a real student, I think that that's like one of the biggest things with transferring overall is feeling like I belong here or that I even am a real student in general, because I often feel small and like a speck of dust. I used to be so motivated in high school, and I would do all the extracurriculars like always show up to class.” (Amanda)
James used the word “overwhelming” 12 times during the interview when referring to his Calculus 2 experience at a R1 institution. He attributes his feelings of being unprepared by feeling “out of my league” compared to his peers and the results of his first test really lowered his confidence level in Calculus 2. James did use strategies to help obtain further support to improve his success in Calculus 2.

“I definitely felt, I guess, in transit. Transit, no, what was it? Transfer students in general, I feel like I am sorta out of my league at first like it is my first semester here at University B and I’m taking calc II, and it is very overwhelming. I would say. I just feel like a little bit out of my league going into it at first, especially trying to get the help I want or the help that helps me the best.” (James)

Sub-Theme 1.2: Lack of Quality at Non-R1

Along with the aspects of feeling unprepared for Calculus 2 discussed so far, another interesting sub-theme that emerged involved the participant’s expressing their reflections on the community college and non-R1 Calculus 1 experience as lacking quality compared to their perceptions of Calculus 2 at the R1. This has certainly been alluded to in the participants views from feeling insignificant as a transfer student. However, the sub-theme is interesting because this perception influenced confidence in providing them with a more challenging education.

Many of the participants described their Calculus 1 experience as lacking the quality to prepare them for Calculus 2 at the R1. Andrew hinted at this in his previous quotation by describing the teaching as “inferior” at the community college. Other participants describe missing content in Calculus 1, lack of confidence leaving Calculus 1, lack of engagement in Calculus 1, seem to have an easier time and the view of prestige at the R1. This sub-theme was a surprise for myself because it contradicts the outcome of the pilot study and my own experience teaching Calculus 1 at a non-R1.
Claire’s Calculus 1 experience involved missing a main concept usually covered in the Calculus 1 curriculum, Antiderivatives and The Definite Integral. The curriculum of Calculus 1 typically involves covering the three big concepts of Limits, Derivatives, and Integrals (Bressoud & Mesa & Rasmussen, 2015). Claire discovered this missing content when she began taking Calculus 2 at the R1 but refers to her Calculus 1 experience as bad and even described having to retake Calculus 1 because her previous course didn’t transfer to the R1.

“Bad, I think, if I had only taken that class, it doesn't even it doesn't even transfer into, and I think I don't think it should ever. Because I think if that was the only class I took and then I went into calc two I think I would probably fail out in the first few weeks because we didn't even do anti-derivatives and that's where you start in calc two, right into that, you know.” (Claire)

Unlike Claire’s experience, Brandon described a negative experience in Calculus 1 because of the lack of support and engagement due to the course being completely online and describes a preference for face-to-face instruction. Throughout the entire interview, Brandon constantly referred to the teaching modality as the deciding factor of understanding his transition as a success. He felt Calculus 2 was better because the teaching was conducted in a classroom with the instructor and not online. He described the lacking quality of the rigor in his Calculus 1 course.

“I feel like since calc one was mainly online or that last class, I did not feel engaged or like a lot of support. I feel like Calc one was just lacking. Calc two was kind of a lot different but I felt like I learned a lot more in calc two as it more was face to face and the exams that I'd take, I've learned a lot more of how to be successful in math classes and how I would prefer in person math, now, if I can think of calc three now let's try this to be successful.” (Brandon)

Joshua and Andrew shared a preference in the teaching of Calculus 2 at the R1 in a similar way to Brandon. However, Joshua and Andrew feel the teaching was better quality and preparing them to think critically and use their “brains” in Calculus 2 at the R1. Joshua feels his experience at the non-R1 institution was not challenging enough for his pursuits in STEM and feels this
lack in quality was a detriment to his experience in Calculus 2. However, he feels better about his experience in Calculus 2 even though it was way more challenging.

“I think transitioning over here into University B taking this course for the first time I'm thinking okay well yeah, I wish I had taken this at a previous place, but at the same time I like it only because I feel like my brain is actually thinking. It feels like I'm actually learning all this stuff. It can see the critical thinking, and I know what it helps me because that's something that I want I'm gonna have to do in a future job so it's kind of like half and half you know cuz you have to put in a lot more work than you would another institution. I think that's the big takeaway it kind of like really struck me how there's like a different route for how its taught, you know there's a website or study notes that somebody else makes.” (Joshua)

Participants embraced the challenges that came with transitioning into the R1 and Calculus 2. Along with this challenge came the perceptions of realizing their Calculus 1 experience did not prepare them for Calculus 2. A depiction of the concept map that describes the structures building the emergent theme is presented in Appendix G. In the end, all the participants mentioned this except for one participant. Brian began his university studies at a R1 institution and completed Calculus 1 at the R1 and transferred this credit to the R2 institution and referred to the Calculus 2 experience as simple. Additionally, he emphasized feeling prepared, which this contradicts the overall essence of Theme 1 and the fact that the other participants transferred from non-R1 institutions. I will discuss more about Brian in the discussion and conclusion section of this dissertation.

6.2 Theme 2 – Support is Necessary for Persistence

The second theme that emerged in the data was the notion that support is necessary for persistence in Calculus 2, whether the participants were successful or not. This theme emerged in the data as participants described several types of academic and social support, seeking forms of support, using online resources as support, and understanding a need for these types of support.
The sense of being overwhelmed and feeling alone surfaced in Theme 1. The second theme revealed an understanding of these feelings and knowing that different forms of support are available to alleviate some of the stress and anxiety that comes with transitioning. To transition successfully, the participants highlighted many forms of support they relied on or sought while in Calculus 2 and Calculus 1. Supports were social and academic, and discussed at the non-R1 and R1 institution. The words “support” and “resources” were used extensively throughout the interviews from the participants. One of the main supports talked about was the academic support during both Calculus 1 and Calculus 2, and the quality in the academic support received.

**Sub-Theme 2.1: Academic Support is Crucial**

Academic support and resources tend to refer to support provided by the institutions and support provided in the Calculus classrooms, this could be, from the professor, tutors, and outside of the classroom resources. Below I highlight aspects of Academic Support in Calculus 1, which is perceptions of support received prior to the transition. Also, I highlight aspects of Academic Support in Calculus 2, which involve perceptions during their transition into Calculus 2, which seem to shift comparing the experiences from Calculus 1 to Calculus 2.

**Academic Support in Calculus 1**

Several of the participants emphasized their support from the professor during Calculus 1 as a positive source for support. This experience gave them the impression of having professor support when transferring into Calculus 2. Kay enjoyed the notes provided in class and attributed her success in Calculus 1 to attending office hours.

“Yes, because it was, she was writing everything out on the board so or like on the whatever math teaches use so we can see everything. And I think she would also ask questions that engaged us. She would ask us like what's this or what do we do now, what's here, and that was fun, like being able to type in the chat and knowing the answer. So yes, I felt engaged. And I enjoyed going to her office hours, those were the most helpful for my success.” (Kay)
Brandon felt his professor was motivating by providing lots of verbal feedback and allowing extensions on homework. Brandon really enjoyed his professor and felt that he was very supportive in every way despite the course being online. He constantly encouraged and engaged the class. Brandon felt motivated by having extra time on problems and homework.

“*I mean, he was really like helpful about like setting up times to go over some of the problems in the homework, if you could like before class started. He would tell you that your answer was like right you just maybe a messed up like a plus or minus. He would like give sometimes extensions on due dates, stuff like that for the homework.*”

(Brandon)

Much like Kay and Brandon, Joshua felt his professor set a comfortable tone in the classroom that made them feel as if they were going forward. This set expectations for Joshua to experience further diverse and inclusive practices in his future STEM courses.

“*I think he made it just feel much more I think much, much more readable, I think it was all very due to the Professor. He was just, he was just able to do a good job and we were all I feel like a lot of us were able to keep going forward and catch up with whatever he was teaching.*”

(Joshua)

Like Joshua, James felt comfortable in his Calculus 1 class due to the support from the professor. James described the professor gave him lots of motivation too because he wanted James to become his calculus tutor, but James decided to transfer to the R1. However, at the time of the interview, James wasn’t having success in Calculus 2 at the R1, and he was considering returning to the community college to retake Calculus 2.

“*I think it was a good relationship, it was very open and, I can still remember his name. His name was Professor A, and he was, I would say a great teacher like he knew what he was doing and I like that. In fact, like I think he enjoyed me a lot, even recommended me like to stay back to do stuff like help him, I think it was either a tutoring job for calculus or something around that line, but that's when again I was transferring over here, I guess, I wanted to focus on that, you know going for in person. But, I really enjoyed Community College. I felt like it was a nice school. It wasn't overwhelming to me. I’ll be returning this summer to retake Calculus 2 with the same Professor A.*”

(James)
Academic Support in Calculus 2

Unlike the academic support from the professor in Calculus 1, most of the participants referred to seeking support with tutors and organizational support, such as, academic success centers and tutoring centers that are resources offered to students in Calculus 2 at the R1. However, experiences with the tutors and academic success centers were not always positive. Mostly due to the number of students seeking help and the provided tutors not meeting the quantity. Both Andrew and Claire described negative experiences with provided tutors on campus at the R1. 

Andrew feels like he didn’t receive enough time with the tutors, and they were very inconsistent. He also felt the scheduling with tutors was always overbooked.

“The tutoring not as much due to the scheduling of the tutors and how they were mostly not available at a consistent schedule because they're just being overbooked. So, the Tutoring wasn't really helpful, but it was kind of helpful in a way to kind of let me know that I wasn't alone and that help is out there it's just it's not as accessible as it should be. And the coach kind of helped me just sort of deal with stress and manage the anxiety and all that but um. The Tutoring Center wasn't helpful due to how unavailable the tutors were and how inconsistent they were because I had someone new for three, four sessions each you know someone new per session and they're only 30-to-45-minute sessions available. So, most of my time I would just kind of explain my situation, and most of the time, we can only get like one or two problems worked out, even if we didn’t find the answer just kind of look at them, so the tutoring at the time was not helpful.” (Andrew).

Claire had a similar experience to Andrew, but she felt the tutoring sessions she went to were not helpful because the tutors’ put students into groups and it felt like groups of people being confused together with not much help from the tutors. Since her experience at the tutoring session, Claire made the decision not to return.

“I didn't really like a Tutoring session that I went to because she had us do group work with another person and I had really just wanted to do practice problems and have her go over them because that's the way I learn the best. But because she had us work in groups and she never actually showed us the answers, and we had to work in groups, I had like I did not like it at all, because my partner didn't know what's going on either so when you put together two people that don't understand what's going on and we're not
learning anything from her like it just felt kind of detrimental and like a big time waste so that's why I haven't really gone back to those resources in a while." (Claire)

Although some of the participants did not enjoy the provided tutors on campus, many of the other participants did obtain a meaningful experience with the provided campus resources. Mary, Amanda, and Jake all utilized and even sought on campus tutoring and resources. Mary described several on-campus resources she used during Calculus 2, along with empower groups that include older students and mentors to help them find resources on campus.

“Definitely the empower group. They’re a group of like upperclassmen mentors who are also engineering students and they’ve been through the math courses and they are just they’re very like they’re there if we need anything like social support or like emotional support or also just like academic support and that’s definitely been very helpful just to like have them there for like advice and definitely, the center and calc center which are tutoring and also in across campus there’s more tutoring that is offered as well for engineering students so for any like math or science classes you’re taking and I think there’s also like engineering major specific tutoring as well that they’re also there for helps I think that there’s definitely like a lot of help resources that I’ve gone to that are very helpful and necessary for transitioning into college.” (Mary)

Amanda described an on-campus tutoring center that she and her friends attend together for Calculus 2, and she feels like it is a party for Calculus students. The center consists of other calculus students with graduate teaching assistants walking around and helping students in need. She felt bad for not finding this center earlier in her academic career but not she feels glad to have found it and she attends individually because she feels so comfortable. She really emphasized the need for academic and social support. Amanda often referred to both forms of support as a necessary component for persistence.

“Yeah, that's the Tutoring Center that I had mentioned earlier which is just designated tutoring and they have all kinds of courses that they offer for like tutoring. They have physics, calc two, but, like we’ll go, my friends and I in calc two will go after class every Tuesday and there's, it's like a party in there honestly. There's so many students usually the calculus two students take up like four or five tables and we have like massive whiteboards and we'll all just be collaborating and have the TAs walking around and it's a great community. I'm kind of upset with myself for not getting involved
in it earlier but I, that has helped me out and I go individually after my class, because I have a free period after calc." (Amanda)

Jake has a good experience with his on-campus tutoring center too, and even stresses that attending these are critical for transfer students, because the tutors will slow down and go over material that might have been missed in the fast-paced class in Calculus 2. Jake emphasized the next time he enrolls in Calculus 2; he will certainly take stock in all the forms of support available to him at the R1. Jake had withdrawn from Calculus 2 but seemed very optimistic about returning to take the course due to all the necessary support available for students at the R1.

“I know you’ve heard me bring up Tutoring sessions plenty of times. I feel like they’re critical to transfer students, anybody transferring in, I would tell them that it’s critical for them to go to those sessions. They learn things that they probably would miss because the teacher is moving so fast, dumping so much information. If you go to those sessions, they’ll slow it down, and catch those things for you” (Jake)

Sub-Theme 2.2: Social Support Preferred

Social support preferred surfaced in the data as supports in the social system the participants relied on from friends, family, and peers during the calculus experiences and describing their preference for this form of support. The sub-theme emerged mostly in discussion of their transition experience in Calculus 2. There was only one instance when a participant mentioned support from a friend in Calculus 1, which is interesting since it seems academic support is sought after in both Calculus 1 and Calculus 2. I begin discussing this sub-theme by comparing social supports experienced in Calculus 1 compared to Calculus 2. Also, I discuss the importance of finding balance between academic and social supports, which aligns well with the conceptual framework.

Social Support in Calculus 1 Compared to Calculus 2

Several of the participants mentioned in the interviews that there were not a lot of opportunities for social engagement with peers and social activities with students during Calculus
1 due to the course being online. It is worth mentioning they were enrolled in Calculus 1 during the COVID-19 pandemic. **Mary** described her experience as **utilizing Zoom to meet with a friend to talk for fun and then realized they were in the same Calculus 1 course when they were talking.**

“Well, ok, sorry, I don’t know if it’s quite like a social thing because it was kind of harder to do that with Zoom but I was, sorry, I just had two different thoughts. Okay, I'll say one first, and then the other one, but I had a friend in the class, and so we would sometimes **Zoom each other and just kind of like talk for fun** and then also like I'm trying to remember, I feel like all the zoom school time was kind of like it seems like a time warp because I'm like I don't know how long that was. But, I'm trying to remember it's kind of like a blur **I feel like I do remember that we would video call with each other sometimes because we had been in another couple of classes together and known each other from other previous years and then we're like oh we're in the same math course so even though, like it was through zoom.**” (Mary)

Even though the participants did not have a lot of social interactions in Calculus 1, they seemed eager to return to campus and enroll in active face-to-face Calculus 2 classes. The participants **preferred social support more than academic support.** Along with taking stock of all assets in both the academic and social environments, it is imperative to have that balance for success and persistence. We often neglect this construct but obtaining **the feeling of home can help with the balance.** **Amanda** sought both academic and social support, but **she feels most at home when obtaining academic support through her social interactions with friends and peers.**

“**Um, definitely the social support because it brought that feeling of home to my university and school life, but also helped me out academically and not to say that the academic support wasn't helpful, but just overall like my mentality towards school just shifted a lot having a consistent social and academic support system. But, yeah. I'm not sure what else to say on that one.**” (Amanda)

Like Amanda, James found the balance of social and academic support seeking academic support with friends and peers. **James** even **developed a friendship through discussing mathematics in Calculus 2.** This helped him in the future for other classes.

“The interactions with like my peers, you know I have a buddy I sit next to you know, talk about math and joke about you know it was fine nothing too crazy but um it wasn’t, I
don't know, if it was anything too major. He does help me in certain instances and problems, he is definitely very smart in that way. ” (James)

On the other hand, Andrew didn’t seek social support from peers, but from his partner, whom he relied on for relief in anxiety and time management. He also feels his partner helped him with the devilish void of procrastination. Andrew’s partner keeps him on track and focused on the goal of persisting in Calculus 2.

“Definitely, I guess, my girlfriend and just trying to get a grip on when I should tackle things, how I should tackle things. And like breaking up assignments into little pieces instead of doing it all at once at the last minute and just being like terrified of it for days before it's due and doing it like 10 minutes before it's due and not getting a good score. So, she kind of helps me with my procrastination, time management, anxiety and just kind of all those management skills.” (Andrew)

Other forms of social support that surfaced in the interviews were familial support. Brandon and Amanda described how their parents are paying for college and have relieved them from financial responsibilities. This is an important support for students because of the stress and anxiety of paying for college is an epidemic. Moreover, the student loan epidemic is heightened beyond measure.

“My parents pay for college, I mean my dad uses the GI bill, since he was in the military for a long time he got that privilege, I guess, so that's what I use right now for paying for school.” (Brandon)

Along with the burden of financial responsibilities of paying for college, Kay and Lauren discussed how their parents help them mentally. Parents help them try to find strategies for their success. Familial support was an important emergent code that appeared in the data with a few participants. I only highlight Kay and Lauren, but Brandon and Amanda also expressed the importance of familial support.

“My family really wants me to succeed and they’re always there if I need to talk. And when I talk to them, especially my mom, will help me like brainstorm strategies and you could do this, and this will help. They’re always helping me succeed.” (Lauren)
Online Resources & Support in Calculus 2

When the tutoring centers and social supports did not meet expectations, participants would seek online resources from the popular sites, such as, YouTube and Paulsonlinenotes (Dawkins, P., 2023) for Calculus 2 support. Seeking online resources often seemed to be a preference for some of the participants, but online resources still seemed to be options when on campus academic and other social supports were not beneficial in contributing to success. Andrew described using YouTube for condensed lectures over content material in Calculus 2, but also other courses he was taking at the time. Andrew also mentioned using occasional websites like Paulsonlinenotes (Dawkins, P., 2023).

“I guess YouTube was my only other resource because seeing like the other teachers lectures and just kind of condensed versions, like this one channel that organic chem teacher or bio teacher or whatever, he would have like short and sweet 10-minute videos on some basic calc topics and kind of helped me get the gist you know, I would kind of watch them before tests and all that sort of, I guess bring back anything. But beside YouTube and, like the occasional website like Paulsonlinenotes.com. Those have some pretty helpful resources, that was pretty much it.” (Andrew)

Claire explained that she would rather use online resources instead of walking across campus to attend tutoring sessions. She really emphasizes a dislike for the tutoring sessions available on campus due the different instructors and the walking distance required to attend the session. Instead, she prefers watching videos on YouTube with different instructors to see different explanations. Claire’s preference for online resources is interesting to note since she did somewhat enjoy her academic supports.

“I actually don't go to them much. Because there's like different instructors, you can go to different ones and there’s just a few that I don’t really like and sometimes I just don't have the energy to walk all the way across campus and go to them so normally I if I decided to go to a Tutoring session I'll probably just like watch a YouTube video on it instead, which I prefer to use and see different people explaining it different ways, you know.” (Claire)
Although the main supports that emerged in the participants interviews were academic, social, and online resources, it is apparent through the data that to be successful in Calculus 2, support is most definitely necessary. Social support was not sought-after during Calculus 1 and the participants did not describe seeking online resources during Calculus 1. The participants mainly relied on support from their professor in Calculus 1 for success, but Calculus 2 required support from all aspects discussed for success. Therefore, I deduce that support is necessary for persistence in Calculus 2 and with some of my participants, support was necessary, but not enough for success in Calculus 2 at the R1. A depiction of a concept map that provides underlying structures that constitute the emergent theme is presented in Appendix H.

Upon aligning with the conceptual framework and understanding the theoretical constructs that describe transition, the participants constantly referred to the human attribute of that we must possess to defeat our foes or overcome adversity. Although I do not mean to align Calculus 2 with the pessimistic terms’ “foe” and “adversity”, the participants in this study often described their experience in Calculus 2 as if they were facing an enemy and this association with the term of “weed out” class. Without a loss of generalizing the entire population of this study, facing one’s fear of completing the “weed out” class required taking stock in more than the resources described by Schlossberg. The next Theme that emerged in the data captures how the participants reflected on their transition and perceived their current experience while enrolled in Calculus 2.

6.3 Theme 3 – Perseverance Matters

The third theme emerged as a reflection of the participant’s that had taken Calculus 2 and emerged as a perception of students enrolled in Calculus 2. Many of the participants described using strategies and relying on different forms of support as necessities during the transition process. They emphasized the action of perseverance during the transition process in Calculus
2 to successfully transition in the course and complete Calculus 2. Participants highlighted determination, maturity, Goals for STEM, utilizing strategies, and having positive views of academic future and Calculus 2 as main categories that contributed to the overarching theme of **Perseverance Matters**. Claire really described her reflection of transitioning into Calculus 2 **requiring hard work and perseverance**. Claire was enrolled in Calculus 2 at the time of this quotation. **Claire** perceived hard work and perseverance as motivating factors to push her along in the course.

"I think hard work and perseverance, mainly those are the big traits that kind of push me along through calc two like I really try to understand what's going on, and especially for the exams like I crammed really, really hard for it because I really wanted to do good so yeah, I think persevering is the main thing that will help me do good in calc two." (Claire)

Taking stock of all coping resources were helpful during the transition phase, but after exhausting all avenues of available assets to be successful **perseverance became the important attribute traits that were used to persist through Calculus 2, whether successful or unsuccessful**. Jake described this attribute of **persevering by having the determination of “never giving up”**. Jake is a transfer student that works part time off campus and goes to university full time, and he describes his studious effort as an important aspect of his life that he focuses on until he succeeds. **Jake** had withdrawn from Calculus 2 at the time of the interview. However, Jake left a huge impression on my interpretation of the emergent theme due to his determination and optimistic outlook on his situation. This determination is exemplified in his reflective statement.

"I will definitely stick with it, even if I don't because I honestly feel like I will keep trying to take the class until everything to click. So each time I'll see my grade slowly getting better, so that means I’m learning, things are sticking more and more each time I take it. And so it, I will definitely keep taking it until I understand 100% of it. And the next time I take it I will definitely study more and utilize all of my resources. But taking the class it did, you know, bring in the sense of maybe I could do this degree or switch them or whatever, but that was just so like, the fear, maybe coming in. But I will
definitely keep trying to take the class. I don't plan on switching my degree any at all. I plan on keep trying the classes until I succeed in my pursuits.” (Jake)

Other aspects of perseverance that emerged in the data are the goals many of the participants have in STEM influenced their determination to succeed and persevere in Calculus 2. Personal attribute, having interest in STEM, family background, and having a determination to pass Calculus 2 were all major categories that contributed to the emergence of the next sub-theme. Even when some of the participants knew they were not going to be successful in Calculus 2 and need a passing grade to pursue STEM for further studies in the higher-level courses. They exemplified their goals for STEM as a determination to persevere in Calculus 2.

Sub-Theme 3.1: Goals for STEM

This sub-theme emerged across all the participants and many of them discussed their goals as a major influence on their determination to complete Calculus 2 with success. James discussed his goals for pursuing mechanical engineering and robotics at the R1 institution and how he is determined to be successful in Calculus 2 and becoming an engineer through perseverance. James was enrolled in Calculus 2 during the time of this next statement.

“I would say, I’ve known for a long time, what I wanted to do, which was robotics engineering or mechanical engineering, and so, R1 University, being in Country is known for the engineering department, is known for engineering, and so I had my eyes on R1 University for a while now going through community college. I felt like that’s what, I had that mentality, where, if I know I’m going to or if I believe I want to be somewhere myself, then things will align for that to happen, and I tell myself that I was going to go to R1 University and complete calc two and become a kind of engineer. And so far, everything that I wanted to do in life is going on the right track. It's not easy, but I’m trying to make it happen and I’m determined to make it happen.” (James)

Moreover, Mary was asked about reflecting on her transition in Calculus 2 at the R1 and she described her determination to successfully complete the course because she knows she has the persistence, and she is influenced by her goal to become an engineer. Mary exemplified perseverance in her reflective statement.
“I think that I definitely know I want to finish it (Calculus 2) and, like I'm very determined to do that, and I really enjoy it. It's definitely a challenge for me, and I think that it's like a good type of a challenge, and so I know I want to pass it because I really love engineering and want to do engineering, I feel like it's like because, especially since I'm already in it, and like I've kind of, I have like a very like I have a very persistent like determined mindset, I guess, like so like I like I know I can do this.” (Mary)

Joshua describes his aspirations in pursuing computer science as a major influence on his determination to successfully complete Calculus 2. This goal is a contributing factor that influences Joshua’s perseverance and emerged in the data. Joshua was enrolled in Calculus 2 during this quotation and attributed his goals as a motivating factor for passing Calculus 2.

“So, my goals and career aspirations by transferring into R1 University. I definitely want to be successful in the classes, I don't just want to pass them to pass them, I really want to understand the material because I am majoring in computer science, so I feel like calculus two is something I really need to pay attention to and do well in so I can do computer science. I'm still wanting to, I'm planning to get my bachelors in computer science and I plan to get a minor in electrical engineering. I want to be able work for virtual reality one day, and I feel like electrical engineering is something that I've had people mention telling me well, in order to understand, maybe the headsets probably want to take something like that, like that it would look good on your resume.” (Joshua)

Goals for STEM were an influence on the participants to persevere in Calculus 2 because to pursue a STEM degree, Calculus 2 is a required course and a prerequisite for many of the upper-level courses. Academic interests and passions for subjects certainly had a vital role in the perseverance during the transition process. I have discussed in previous themes and sub-themes the need for support and the view of self as insignificant as a transfer student, which led to needing support because of feelings of being underprepared for Calculus 2 at the R1. Reflecting on the perception of the transition process, participants emphasized strategies used along with their perseverance.

Sub-Theme 3.2: Utilizing Strategies for Success

This sub-theme captures strategies discussed by the participants used to help encourage perseverance for success. Several participants describe strategies utilized during their transition
and discuss the strategies that were most helpful and useful for their transition. One of the most common strategies discussed is working problems and studying problems. Other contributing categories of this subtheme were attending office hours, seeking on-campus support, and taking stock in all available resources. This subtheme shares some similar categories with Theme 2 Support is Necessary for Persistence. Claire described her biggest strategy as working through lots of problems until she conceptualized the material and understood the content.

“The biggest strategy that I like to use in preparing myself is doing lots of practice problems. I feel like sometimes if I don’t understand the material and I work out enough problems with the exact same types of methods and questions, then normally I can like problem solve my way through it and figure it out.” (Claire)

Amanda shares a similar sentiment with Claire as she prefers working problems with friends to understand the material and finds working problems alone sometimes while listening to music as a very helpful strategy. This is related to the subtheme Social Support Preferred, which Amanda highly emphasized in her experience in Calculus 2. Amanda never lost hope in her abilities and viewed perseverance as a determination to complete Calculus 2.

“I just kind of designate time for math homework and get with my friends or I’ll just be at home and put on some music and just start working on some math but it’s um yeah just doesn't get any time I guess.” (Amanda)

Brandon described attending office hours and Calculus study center to seek help while working problems and considered these as his main strategy especially when preparing for exams, but working problems is the most important. This experience also aligns with the subtheme of Academic Support is Crucial for persistence. Additionally, Brandon highlights the strategy of utilizing forms of academic support.

“I did go to his office hours a few times to get a little help with the homework, especially during solids and revolutions because I really struggled with that. Calc center is in the building where you can meet with professors or other professors who have the same math level. So, I went to those, there were also review sessions that I went to before the exam that you could like work on problems before the exam and I went to
those for the second and third exams which I did better on than the first exam so that was helpful so yeah those are the, I utilized like going to the office hours and review sessions for the exam so I would be a bit more prepared.” (Brandon)

Even though strategies were utilized with perseverance, two participants had withdrawn from Calculus 2 and four participants enrolled in Calculus 2 at the time of the interviews expressed concerns about failing the course. I associated transfer students failing Calculus 2 because of a negative transition into the course and an overall negative environment in Calculus 2, but the transfer students were very optimistic and highly motivated by understanding the content. In fact, the pilot study results reflect the negative aspects but neglects any optimism, unlike the results of this dissertation. A depiction of the structures that ultimately constituted the emergent theme is presented below in Appendix I. However, the next theme captures a personal responsibility that the transfer students aligned with during and reflecting on their transition. The next theme was a surprising emergence for my interpretations of the interview data.

6.4 Theme 4 – Takes Individual Responsibility

This theme emerged in the data as participants discussed what they attribute to their success or lack of success in Calculus 2. They described an understanding for the support and resources available to them on campus and their ability to utilize strategies for success along with perseverance, but after all the coping mechanisms manifested subconsciously, they described the need to take individual responsibility for their success or lack of success in Calculus 2. The theme emerged as clustered categories of feeling confident in self, adapting to independence, take responsibility for success and lack of success, and understanding the math requirements for their STEM degree along with emphasizing the importance of the academic environment. This theme might seem depressing for those participants that were unsuccessful, but I would disagree with that notion. The participants who were not successful, described a determination
for the perseverance of succeeding in Calculus 2. I interpret this as personal growth and taking a personal account for their individual responsibility for understanding their own abilities and self during the transition process. Mary points out she knew Calculus 2 was hard and she must take responsibility for her preparedness, and she attributes her success to hard work and perseverance.

“I think, part of it is also my fault, you know, I have to take some responsibility in how prepared I am for this class, like I knew it was going to be hard. But I would say that, on the flip side my successes are due to me and due to working hard and paying attention in the class.” (Mary)

Another participant emphasizes the accountability taken as being successful falls on their shoulders. Kay describes a moment of realization taking individual responsibility in her learning by doing the work and utilizing strategies of attending office hours. These personal growth moments ensured she completed homework before the due date.

“Now it falls on my shoulders to make sure that I do work. That I finish my notes or look over them or go to office hours afternoon I may need which that is one thing I have been pretty good at and make sure that I do the homework like before it’s due.” (Kay)

Many participants discussed strategies and different forms of supports received to help navigate their transition. Participants discussed hearing rumors about Calculus 2 being the most difficult mathematics class at the R1 and rumors that Calculus 2 is a course designed to “weed out” students not suitable for STEM. Several of the participants described difficulty with the concepts, particularly, Volumes of Solids by Revolutions and other content. Many discussed spending more time on campus at the R1 as opposed to their previous institution and how this made them feel like a “real student” rather than just a transfer student, and as much were finding themselves taking on more individual responsibilities to ensure a successful transition in Calculus 2.
Lauren initially wanted to blame her calculus professor’s fault for her lack of success, but she realized during her time in Calculus 2 that she was not passionate enough for learning the material and she takes full individual responsibility for her learning. Lauren ultimately decided that STEM was no longer her passion, and she was only pursuing STEM because of her family background of engineers. Her individual responsibility during her transition in Calculus 2 helped her realize her true passion for early childhood education. I interpret her epiphany of switching majors as an optimistic personal growth and maturation moment in Lauren’s perception.

“Initially it was this is my calc one professor's fault. And then, it was maybe this is just not for me. At least in high school which granted is different from college I'd never had any issues with numbers, loved trig, loved stats, geometry, whatever else. And then I got to calculus at the college level, I never took it at the high school, excuse me and I just thought, maybe this isn't the path for me, maybe I'm not cut out to be a calculus student. But it was not fun.” (Lauren)

Amanda is in a similar situation to Lauren, but Amanda’s situation is she feels she is in a purgatory state of not feeling motivated, not knowing if she is doing enough to be a student, and not wanting to attend class. She feels like some days school just takes away from her social life, which is very important to her. Amanda constantly refers to her social environment, which I interpret as a factor to the lack of her success aligning within the theoretical constructs of Tinto’s Theory. She exemplifies the essence of taking and owning individual responsibility. However, she ultimately decides after pondering all these questions, that she is not doing enough for Calculus 2 and that is why she is not successful. Amanda attributes her lack of success in Calculus 2 to her own effort.

“Because, I am not very motivated and I feel like I don't do enough, like the ahh the main thing that I struggle with is like going back and forth of like okay, am I actually like studying as much as I should be? Am I being a student and taking time to do the extra things that need to happen to be super, super successful in this course, like not just pass? I get super overwhelmed and I'm hard on myself about what like success is because I used to be such a perfectionist and well, I still am and straight A's were the expectation for my success as students, but I am having, I’m struggling so much with making that
happen in college and I can't tell if it's because I'm truly not meant to be learning this if it's not like a subject that I can grasp easily or I'm just not putting in enough work to make it happen. But I just have so many things in life that I need to stay to, need to be fulfilled I'm realizing like it's not all about one thing and some days I just don't feel like doing school at all, but just knowing how to crack down and force myself to do the things I don't want to do when it needs to happen is so difficult and I don't know if that's because I feel like school takes away from my social, which is so important to me, or if I'm working too much because I have so many things that I want in my lifestyle financially that I want like that I feel the need to keep but ultimately it just comes down to me and me not doing enough for this class.” (Amanda)

Amanda is the only participant in this study that had enrolled in Calculus 2 four times and was unsuccessful three times. She enrolled in Calculus 2 at the community college 2 times, at a non-R1 4-year institution 1 time, and at the time of the interview, she was enrolled at the R1. She described lots of support and strategies she utilized, and she symbolized perseverance as a tool for a successful transition in Calculus 2, but ultimately, she accepted her individual responsibility for her lack of success in the course.

Taking on these individual responsibilities for their success or lack of success in Calculus 2 led to discussions about what their transitions mean to them. For many, the transition into Calculus 2 at the R1 felt “intimidating” and “overwhelming”, but I interpreted this perception as the participants are moving forward and better prepared for their career aspirations in STEM. Andrew explains that Calculus 2 at the R1 is more in-depth and a serious course. This affected his transition in an intimidating way.

“Calc 2 at the R1 University was kinda like running into a wall and having to scale that wall instead of those steps because of how like its reputation of it being like we have class and it being much more in depth, much more like a thing, a bigger course load and I guess like less excuses tolerated, so it's a much more serious course as opposed to Community College.” (Andrew)

Joshua describes a similar intimidating transition compared to Andrew, but Joshua feels like the transition into Calculus 2 at the R1 is improving his learning by giving him the ability to critically think. He described the course as preparing him better for his future job. Joshua and
Brandon both pointed out that the transition moved them forward to pursue academic endeavors they were passionate about and giving career potential for a better and stable financial future.

“I think transitioning over here into R1 University taking this course (Calculus 2) for the first time I'm thinking okay well yeah I wish I had taken this at the previous place, but at the same time I like it only because I feel like my brain is actually thinking. It feels like I'm actually learning all this stuff. I can see the critical thinking, and I know what it helps me because that's something that I want I'm gonna have to do in a future job so it's kind of like half and half you know cuz you have to put in a lot more work than you would at another institution.” (Joshua)

Taking individual responsibilities of their transition into Calculus 2, the participants gained a deeper understanding of their own personal abilities and growth. Revealing personal developments by understanding their success or lack of success is attributed to their efforts and perseverance in the course. Whether they were successful in Calculus 2 or unsuccessful, it became apparent in the interviews that taking individual responsibility was an important structure of the perceptions and reflections of their transition process. I do not interpret this theme as a detriment for those who were not successful or felt as if they were not going to succeed. I interpret this theme as an overall maturation to their future transitions and success in academic endeavors. This theme highlights the importance of maturity, intellectual growth, and a strong motivation for understanding the content in Calculus 2. A depiction of the concept map for theme 4 is presented in Appendix J.

6.5 Aligning Results with Theory

As discussed in Chapter 3 of this dissertation, my study is framed by my guiding conceptual framework. The conceptual framework is a seminal theory that guided my data collection and analysis. It is essential that the results are framed within the context of my guiding conceptual framework. To recall, the conceptual framework is comprised of Schlossberg’s Transition Theory and combined for theoretical support from Tinto’s Theory. The framework consists of three
phases: Moving In, Moving Through, & Moving Out. Within each phase are constructs that are theoretically describing attributes and coping mechanisms that an individual subconsciously perceives during a transition process. During the Moving Through phase, there are coping mechanisms within the academic and social systems: Self, Situation, Support, and Strategies. Each coping mechanism is perceived as an asset or liability by the individual. The themes that emerged in this study provide structures of the participants perceptions of their transition into Calculus 2 framed within the constructs of the conceptual framework. The following Table 10 shows the emergent themes along with sub-themes as results from this study.

**Table 10 - Emergent Themes Aligned with Conceptual Framework**

<table>
<thead>
<tr>
<th>Themes</th>
<th>Sub-Themes</th>
<th>Theoretical Construct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1: Feels Unprepared for Calculus 2</td>
<td>Sub-Theme 1.1: Felt Insignificant as Transfer Student</td>
<td>Moving Through -Self &amp; Situation</td>
</tr>
<tr>
<td></td>
<td>Sub-Theme 1.2: Lack of Quality at non-R1</td>
<td>Moving In – Attributes of Transfer Institution</td>
</tr>
<tr>
<td>Theme 2: Support is Necessary for Persistence</td>
<td>Sub-Theme 2.1: Academic Support</td>
<td>Moving Through Support</td>
</tr>
<tr>
<td></td>
<td>Sub-Theme 2.2: Social Support</td>
<td></td>
</tr>
<tr>
<td>Theme 3: Perseverance Matters</td>
<td>Sub-Theme 3.1: Goals for STEM</td>
<td>Moving In – Goals</td>
</tr>
<tr>
<td></td>
<td>Sub-Theme 3.2: Utilizing Strategies in Calculus 2</td>
<td>Moving Through – Strategies</td>
</tr>
<tr>
<td>Theme 4: Takes Individual Responsibility</td>
<td></td>
<td>Moving Out – Taking Stock</td>
</tr>
</tbody>
</table>

The themes emerged due to viewing through the lens of my conceptual framework. I interpret the themes aligning with constructs of the conceptual framework. During the “Moving Through” phase of the framework, *themes 1 & 2 along with sub-themes 1.1, 2.1, 2.2, and 3.2 align within the overall constructs of the coping mechanisms: Self, Situation, Support, and Strategies.*
The Self & Situation mechanisms aligns with Theme 1: Felt Unprepared for Calculus 2 and Sub-Theme 1.1: Felt Insignificant as a Transfer Student. The Support mechanism aligns with Theme 2: Support is Necessary for Persistence, Sub-Theme 2.1: Academic Support Crucial, and Sub-Theme 2.2: Social Support Preferred. The Strategies mechanism align with Sub-Theme 3.2: Utilizing Strategies in Calculus 2. These themes emerged in the “Transition Experience” phase of the interview protocol and elements emerged in the “Reflective” questions from the protocol. The reflective themes emerged with participants that reflected on their experience after taking Calculus 2 and with some of the participants enrolled in Calculus 2 at the time of the interviews, Theme 3: Perseverance Matters & Theme 4: Takes Individual Responsibility. These themes align within the “Moving Out” phase of the framework. However, I interpret Theme 3: Perseverance Matters with structures that align throughout the entire conceptual framework. I interpret the theme of Perseverance Matters as a subconscious construct that participants encountered through the entire transition phase. Additionally, sub-themes 3.1 and 1.2 align within the “Moving In” phase of the framework due goals as being an influencing factor prior to the transfer and staying consistent as the transition between phases of the framework. The following Figure 10 depicts my interpretation of the themes aligned within the constructs of my conceptual framework.
6.6 Addressing the Research Questions

According to Larsson and Holmström (2007), studies that employ phenomenological methods to seek emergent themes, provide structure to the essence of the phenomenon. I employed phenomenological methods guided by a conceptual framework that sought to understand how transfer students perceive their transition experience in Calculus 2 at R1 institution. The themes that emerged in this study provide structures for how the participants in my study perceived their transition. The previous sections I discussed the themes and interpretations of their alignment within the framing of the conceptual framework. Below I discuss my interpretations of the themes as structures that address the guiding research questions of this dissertation.
RQ1: How do transfer students perceive and make sense of their transition experience in Calculus 2 at a research-intensive institution?

Theme 1: Feels Unprepared for Calculus 2 and Theme 2: Support is Necessary for Persistence, provide structure for interpreting this research question. The phenomenological investigation revealed participants perceive their transition while enrolled in Calculus 2 at the R1 institution as feeling behind, overwhelmed, unprepared, and insignificant as a transfer student along with viewing their previous institution as lacking in quality compared to the R1. The participants made sense of their transition by understanding that support is critical for success. Participants emphasized the need for both academic and social support in Calculus 2 and discussed relying on other resources and forms of support. Gaining this understanding and accepting experience allowed the participants in this study to have a positive outlook on their Calculus 2 course at the R1.

Furthermore, elements of sub-themes contribute to the structure of this research question. The participants enrolled in the course emphasized the quality of Calculus 2 at the R1 and lack of quality they felt at the non-R1. The participants emphasized the prestige they felt at being at the R1 and they emphasized feeling prepared and better taught at the R1 institution. They discussed goals they have for their future in STEM and their determination to succeed in Calculus 2. I interpret the results of this question as an optimistic outlook for future transfer students in Calculus 2.

RQ2: How do transfer students reflect on and understand their transition experience?

RQ3: To what do they attribute to their success and/or lack of during the transition experience?
The two questions proposed are related in that I developed them with the intention of understanding a reflective aspect of their transition and how the participants interpreted their own success or lack of success during their transition. As discussed in the previous sections of this chapter, the theme that emerged mostly as a reflection and understanding of the transition in Theme 3: Perseverance Matters. I would like to also mention, the theme also emerged through participants enrolled in the course, but this theme became apparent during the interview protocol that emphasized a reflective response. It is also important to note, the interviews were conducted during the months of April and May, which the participants enrolled in Calculus 2 were asked to reflect on their transition, which is how aspects of Theme 3 emerged from those participants perception of their reflection. The participants reflected on their transition referred to perseverance as a key for success. This theme became apparent with the participants as they discussed hard work, taking stock in all resources, maturity, and determination to succeed for their future goals and aspirations. The participants emphasized their goals for STEM as influencing factors for their perseverance and utilizing strategies to get through the transition. This theme is important since it aligns theoretically throughout the entire guiding conceptual framework.

Elements of Theme 1: Feels Unprepared in Calculus 2 and the corresponding sub-themes 1.1 and 1.2 emerged as attributes for what students’ reason for their lack of success in Calculus. The participants discussed feeling overwhelmed, behind, and faster paced as reasons for not being successful in Calculus 2. However, I interpret Theme 4: Takes Individual Responsibility as the overarching theme that attributes to participants success or lack of success in Calculus 2. The participants exemplified their own responsibility for being successful or unsuccessful in Calculus 2. This is an understanding of maturation and progression for the
participants, since this attribution enhances the transfer students to grow in their determination to become successful in their STEM pursuits. Many of the participants emphasized that successfully passing Calculus 2 would be up to their own determination.

The following Figure 11 shows a depiction of how I interpret how the emergent themes aligning with the main constructs of the research questions. Further understandings of the subthemes and codes that are theoretical structures of the overarching themes can be found in the Appendices showing concept maps that provide my interpretation of the construction of the emergent themes generated in NVivo 13.

![Figure 11 - Themes Aligned with Research Questions](image)

6.7 Interpretive Findings

Further interpretations within the context of the emergent themes revealed asset-based findings regarding the participants. I will discuss these interpretations while referring to the main emergent themes, as well as their relation to the research questions and conceptual framework.
These findings exemplify further experiences that my participants emphasized during the interviews and revealed during the discussion of the emergent themes. Understanding of these findings show important aspects of transfer student experiences in Calculus 2 at the R1 institution.

**Internalized Transfer Status**

Within the context of Theme 1: Feels Unprepared for Calculus 2, transfer students revealed intense feelings of being behind, feeling unaccepted, inadequacies, insignificant, and feeling like they do not matter during their experience in Calculus 2 at the R1 institution. These feelings were attributed their perceptions of being a transfer student. The transfer status became an internalized perception of the ‘self’ during the transition process. The internalization was revealed while living the phenomenon of transition. Transfer status appeared to be a detriment to their perception and sense making of the transition. This aspect of their lived experience cannot be denied through expressions of internalized transfer status. The transfer status is revealed as a systemic barrier for transfer students as they perceive their transition into the R1 institution.

**Support System Shift**

Community colleges often provide students with a sense of comfort and “community” as the proverbial name suggests and as studies highlighted in this dissertation suggest as much. Support systems at community colleges tend to involve the instructors and other institutional supports. Transfer students expect this support at 4-year and R1 institutions, because as they transition, they seek the feelings of comfort and being accepted within the academic environment. The participants of this study certainly highlighted these feelings of support from the instructor during their Calculus 1 experience and a need for support from the instructor during Calculus 2 but feel less support from instructor at the R1.
Within the context of Theme 2: Support is Necessary for Persistence, transfer students highlighted the importance of support systems at their transfer institution and the R1 institution. They highlighted academic support as critical and social support as preferred at the R1 and support from the instructor as preferential and critical at the community college or non-R1 4-year institution. During their transition at the R1, the support system shifted from relying on the instructor to preferring social support and support from academic resources available on campus and online. They began making sense of their transition by recognizing the shift in their support system by integrating academically and socially at the R1 institution.

**Understanding Content Motivation**

Traditional students in universities and colleges are often motivated by their grades and grade point averages (GPA) as a metric to their successes and failures during academic endeavors. This is especially understandable since progression in academics requires passing grades and even certain programs require a specific GPA measure. However, for this dissertation study, Theme 3: Perseverance Matters and Theme 4: Takes Individual Responsibility reveal transfer students are highly motivated by understanding the content as a success. Transfer students are utilizing their resources and express a deep motivation to understand the content in Calculus 2 to be successful and did not highlight grades as a motivation for success in Calculus 2. The transfer students that were unsuccessful in Calculus 2 even emphasize the importance of understanding the content as a strong motivating factor for their future success. This finding is certainly an asset for institutions to help combat the embedded systemic barriers.
6.8 Conclusion

This study attempts to understand the lived experiences of transfer students in Calculus 2 at a R1 institution. The results and findings of this study provide structures of the perceptions and reflections of the phenomenon of transition. This chapter discussed the main results of this study as emergent themes, my interpretations of the emergent themes in this study and how they align within the context of my conceptual framework. Additionally, I discussed how I interpret the emergent themes as addressing the guiding research questions of this dissertation study. Furthermore, I emphasized more interpretive findings revealed through the analysis and interpretations of the emergent themes. I would like to emphasize that these results are based on the qualitative data collected and my interpretations of this data. I now turn the attention of this dissertation to discuss these results further, connections to education literature, limitations and delimitations for this study, implications that arise from this study, recommendations for future work, and my final thoughts regarding this dissertation work.
Chapter 7

Discussion & Conclusion

My purpose in this study was to provide an understanding of the experiences transfer students encounter while transitioning into Calculus 2 at a R1 institution. As discussed in Chapter 2, research on transfer students in Calculus 2 is scant. This study contributes to addressing the gap in the literature on experiences transfer students encounter in Calculus 2 at the R1 institution. The results of this study provide an understanding of the experiences of transfer students encountered as they transitioned into a Calculus 2 class at a R1 institution. The emergent themes represent the structures of the participants' essence of their perception and reflections of the transition process. These structures are related to previous constructs highlighted in the field of education research.

7.1 Connections to Education Research Literature

The themes and sub-themes that emerged in this study do not define all experiences transfer students can encounter. Rather, the themes provide a theoretical understanding of how the transfer students experienced their transition, reflected on their transition, and to what they attributed their success or lack of success in Calculus 2. The themes aligned within the framing of the conceptual framework, which is developed from the psychological theory of Schlossberg’s Transition Theory and the educational framework of Tinto’s Persistence/Departure theory. Moreover, the results provide a small lens of beginning to understand the experiences of transfer students in Calculus 2 at the R1 institution.

Lanaan’s (2007) study found that community college transfer students have a difficult time adjusting to the academic rigor at 4-year institutions compared to the community colleges. My
study showed that transfer students feel unprepared for Calculus 2 at the R1 and feel that their previous transfer institution lacked the rigorous quality that an R1 appears to exalt, which aligns with Lanaan’s quantitative study. Flaga (2006) outlined dimensions for adjusting to a 4-year institution for community college transfer students which are considered strategies for transfer students to utilize to successfully adjust to the 4-year institution. The dimensions involve, Learning Resources, Connecting, Familiarity, Negotiating, and Integrating within the 4-year institution. My results reflect the dimensions of Learning Resources, Connecting, Integrating, and Familiarity with the emergent theme Support is Necessary for Persistence by understanding the available resources and support, connecting with available resources on campus, familiarizing with the R1 institution for academic support, and integrating within the social systems by meeting peers and becoming friends in class.

Other studies in education research found community college transfer students often have lower levels of retention and degree completion when compared to traditional students who stay at the same institution for the duration of their degree (Bretschneider, 2022; Blekic et al., 2020; Ishitani, 2008). This can be echoed in my results by finding that the transfer students in my study did not feel prepared for Calculus 2 at the R1 institution and feel insignificant as transfer students. My results showed that transfer students discussed feeling overwhelmed and behind compared to their peers who are traditional students. Breschneider (2022) also pointed out that community college transfer students often feel unaccepted and unsupported at receiving 4-year institutions and are often pushed aside by administrators due to systemic barriers. Highlighting this further, Alexander and colleagues (2009) found that administrators and instructors at one 4-year institution do not view community college transfer students as “real” students. These studies certainly connect
with my emergent themes *feels unprepared for Calculus 2 and feels insignificant as a transfer student.*

Another study from the field of education research that employs Schlossberg’s theory compare with the results of this study. Lazarowicz (2015) used Schlossberg’s theory to study how community college transfer students transition into a 4-year institution. He found that transfer students perceive their transition as “taking time” and requiring “maturity”. Lazarowicz (2015) also describes community college transfer students as being very cognizant of their “financial decisions” and understanding their need for “institutional support”. These concepts are similar and different from the results of this study. Lazarowicz’s (2015) study also finds that *support is a critical component for a successful transition* into the non-R1 4-year institution. Support is certainly an emergent theme from the participants in my study. Along with “maturity” in the themes of *Perseverance Matters and Takes Individual Responsibility*. Lazarowicz (2015) also described transfer students’ *importance of taking of personal responsibility* as a major finding, which aligns with the emerging theme of *Takes Individual Responsibility* from the participants of this dissertation. However, “Perseverance” as a theme and “Feeling Unprepared or Insignificant” were not discussed or implied in Lazarowicz’s study. Additionally, the interpretive findings discussed in the previous chapter revealed transfer students’ feelings of internalized transfer status, support system shift, utilizing strategies and feeling motivated by understanding the content all in the context of experiences in Calculus 2 at a R1 institution, which are not present in any of the education literature discussed. Furthermore, the studies from education research literature are not describing transfer students’ experiences in the context of Calculus 2.

Schlossberg’s own work neglects the concept of perseverance in transition. Which is a result of my study exploring transitions, perseverance emerged as a necessary subconscious
component to perceive successful transitions. Without being presumptuous, I would argue that perseverance can be a construct that can extend the structures within my conceptual framework. As previously discussed, the perseverance theme aligns throughout all the phases within the conceptual framework. This theme seems to be an important construct to influence successful transitions. I interpret the theme as a driving factor that fuels the phases of the conceptual framework. The following Figure 12 depicts the conceptual framework with my interpretation of adding the construct “Perseverance Matters”.

Figure 12 - Revised Conceptual Framework
7.2 Brian’s Contradiction

One participant’s experiences did not follow a similar interpretation as the emergent themes revealed. Brian is the only participant that did not satisfy the criteria I used for sampling, but I did not realize this until the interview was conducted. Brian started university at a R1 institution and transferred to an R1 institution, so he completed Calculus 1 at a R1 and transferred that credit into another R1. His experience in Calculus 2 was different as he did not feel insignificant as a transfer student, in fact, he did not distinguish himself amongst his peers unlike the other participants who felt behind, felt like a speck of dust, felt small, and insignificant as a transfer student compared to their peers. Additionally, Brian felt prepared for Calculus 2, he described his Calculus 1 experience in a positive perspective and felt the course adequately prepared him for Calculus 2. His feelings can be highlighted in the following statement by Brian.

“Yeah, I think I probably talk about like those first couple of weeks I don't know I think we just learned about integration, which I found simple, and that was something that we don't do too much in calc one or like you do, but not as difficult. Yeah, but I think calc one prepared me for calc two, because I didn’t have trouble with calc 2 at all and I am hoping I’ll get an A in calc 3.” (Brian)

At the time of the interview, Brian was enrolled in Calculus 3, which is the third calculus course in the calculus sequence. Different from his peers, Brian did utilize strategies and relied on some academic support, but not all the varying supports described in the emergent themes the other participants discussed. Lastly, Brian did take account for his own individual responsibility, but he did not seem to have as difficult time transitioning compared to the other participants. Brian’s experience is certainly an important aspect of this dissertation as it highlights a student from an R1 transferring to another R1 seems to be more academically prepared than students who transfer from community colleges.
7.3 Limitations & Delimitations

Qualitative research is a powerful methodology used in many fields to explore the lived experiences, cultures, languages, behaviors, emotions, and feelings of human beings and relies on researcher interpretation to deduce meaning from the empirical observations and provide descriptions of the perceived observations (Rahaman, 2020). As with interpretive qualitative research and my ascribed use of Phenomenological Methods for this study, there are inherent limitations and delimitations that should be addressed as well as other concerns for using qualitative methods (Creswell, 2007; Moustakas, 1994). This unfortunate aspect of qualitative research is why it is important for the quality of the research, which I discussed my usage of the $Q^3$ framework in Chapter 5. Below I discuss the limitations and delimitations of this study.

This study cannot be generalized to the entire population of transfer students in the United States or generalize all experiences transfer students have in Calculus 2. This is generally a limitation for qualitative research, but my study was delimited to recruiting students in the Southeastern and Midwestern regions. Thus, generalizing an entire populous of transfer students would be entirely presumptuous. My study aims to contribute to the gap in literature concerning lived experiences in Calculus 2 and add the abundance of transfer student literature by this intersectionality with literature in the fields of mathematics education and education research.

I used a type of purposeful sampling that I bounded by inclusion criteria I identified as a proxy to explore my participants’ lived experiences. This delimitation constrained my sample size since the purpose of criterion sampling is to provide the conditions as a proxy to explore the phenomenon under investigation (Moser, A & Korstjen, I, 2018). As discussed in Chapter 5, I had a difficult time with recruiting participants for interviews from my local institution. This caused another limitation in the sampling of my study. However, I feel that engaging participants from
other institutions in the United States added strength to my study due to understanding perceptions of transfer students at R1 institutions in different regions of the United States.

Moreover, the themes that emerged in this dissertation are limited to the 10 participants of this study and bounded by the framing of the conceptual framework. Although the conceptual framework is an accepted theory in the fields of psychology and educational research, it is limited in that Schlossberg’s framework was originally designed to understand working adults retiring and not designed to understand perceptions of students. Therefore, the themes that emerged in my study align with the theories of Schlossberg can be limiting other aspects of the transition process that might arise that are not identified in the original theory. As discussed in Chapter 6, Perseverance Matters is a theme that emerged in my study that is not discussed in Schlossberg’s Theory. There could be other contributing factors in a transition that could be subconsciously present. Schlossberg’s Transition Framework describes some of the subconscious coping mechanisms experienced during a transition and these constructs are accepted in the field of Psychology, which is a field that ascribes to study the subconscious.

Additionally, the themes that emerged in this data are also a limitation since they emerged as the researcher’s own interpretation of the data. Of course, to enhance the quality of these interpretations, the other member of the coding team contributed to seeking the emergent themes. However, as a qualitative researcher, I must identify that my interpretations are exactly that, “my interpretations”. My philosophical stances of Radical Constructivist and Interpretivist align with my interpretations of the emergent themes as results of this study. Therefore, my attempt to present the results of this study are limited to these philosophical perspectives as a qualitative researcher. Another limitation is the perceptions and reflections consisted of experiences that were encountered during the disruption of the COVID-19 pandemic. I completely recognize this
pandemic could’ve caused negative perceptions and reflections regarding experiences in both Calculus 1 & 2. Lastly, I must mention my positionality, as a subconscious limitation that might have affected the development of the emergent themes as my interpretations.

As with Phenomenological Methods, mitigating bias by bracketing is an important aspect to uncover the pure eidos or essence of the phenomenon (van Manen, 1990). I used bracketing prompts as a technique to help mitigate my bias and I ensure my analysis team used bracketing prompts. The bracketing prompts can be found in the appendices. In addition, I talked with committee members, other graduate students, and members of my analysis team to help reveal any underlying bias and enhance the validity of my findings. I stress the importance of bracketing, because I fully believe and adhere to only giving voice to my participants and advocating for their experiences. However, I identify bracketing as a limitation, because I know deep in my subconscious bias may exist that didn’t reveal during my reflexivity and bracketing but was attempted to reveal through discussions with the other member of the coding team and committee members.

7.4 Implications

There are a few implications that result from this study for transfer students, mathematics educators and departments, and transfer student programs at R1 institutions. Furthermore, relating the results to existing literature with regards to the curriculum of calculus. I will discuss my recommendations for redeveloping the curriculum for both Calculus 1 & 2. Taking the results into account provides a lens to understanding the implications of this study further. Below I provide further discussions of implications from the results and interpretive findings of this dissertation work, as well as my own perceptive recommendations and opinions as a researcher and mathematics educator.
Transfer Students

Transfer students internalized their own responsibility for successes and failures. They emphasized the importance of personal responsibility and feeling influence from their motivations to persevere. Moreover, they highlighted the need for support and resources, with a particular interest in receiving support from the instructor in Calculus 2 at the R1. This need for support from the instructor transitioned from their experience in Calculus 1 at the community colleges and non-R1 year institution. The participants in this study highlighted “comfort” and “feeling at home” as they received support from their instructor during Calculus 1 and they expected this same support from instructors at the R1 institution. However, they highlighted a lack of support from the instructor in Calculus 2. Transfer students emphasized utilizing institutional resources and online resources as major contributing factors to enhancing the comfort and support they want and need to feel at the R1 intuition. Transfer students are highly motivated by understanding the content of Calculus 2. This motivation is an indicated asset as transfer students are determined to understand the content for their success and not motivated by grades.

Furthermore, transfer students should find hope and optimism as they plan to pursue their dreams at a R1 institution. They deserve to feel equal to their peers at the R1 and not compare their previous institution as lacking in quality. They should completely ignore rumors that they are exposed to about Calculus 2 and remove the term “weed out” from their vernacular. They should seek and use as much support that is available to them for success in Calculus 2 and continue to take account for their own individual responsibility as this will give maturity and growth as they develop and persevere in their academic pursuits. Transfer students planning to enroll in Calculus 2 at a R1 need to feel confident in their abilities and understand the importance of having goals and determination to be successful. Transfer students should take stock of all the resources
available to them at the R1. They should enroll and complete any transfer student orientation offered by the R1.

Mathematics Instructors & Departments

Mathematics instructors need to ensure all transfer students are aware of support and resources available to them. Faculty tend to believe students do not utilize resources, but the findings of this study suggest otherwise. Transfer students will use all resources and support that is available to them, especially at the R1 institution. Mathematics instructors can emphasize available supports and resources to enhance transfer student success. This can easily be accomplished by making a few adjustments to a course syllabus that emphasizes inclusive practices.

- Remove the usage of “Office” Hours and incorporate “Student” Hours. The word “Student” is more inclusive and assuring students that the allotted time is especially for them and not used for other purposes. Students often believe “Office Hours” are instructors time and do not intend to disturb the instructor, particularly at larger R1 institutions. Additionally, incorporate the “Student Hours” information on the online learning platform i.e., ensure the information can be found in multiple online locations.

- Insert “Transfer Student Resource Information” in course syllabi and online learning platforms with links and/or contact information for available institution support and online resources. Use any pertinent resource that is reliable and accepted for transfer students to utilize.

- Provide Calculus 1 review material for transfer students. Focus review material on the topics of Limits, Limiting Process, Indefinite and Definite Integrals.
Furthermore, I recommend more mathematics instructors at the R1 reach out to transfer students when they are obviously having a difficult time with content. Encourage them to attend “student” hours, attend academic success centers, ensure that the students are aware of these resources, and build rapport with them to make students feel comfortable. The R1 institution is a daunting academic and social environment, ensuring transfer students are welcome and are viewed as traditional students is imperative to increase transfer student success.

Mathematics educators and departments at R1 institutions should consider developing a Calculus 2 section that is structured specifically for transfer students. This section could involve longer class sessions that incorporate prerequisite material within the curriculum for Calculus 2 and a more in-depth review of the prerequisite material in the appropriate sections in Calculus 2. This could involve a review of Indefinite and Definite integrals and derivatives of elementary functions discussed in Calculus 1, embedded within the discussions of applications of the definite integral and further integration techniques. This specific section could incorporate the usage of video materials and other required supplemental lectures for more engagement with the material in Calculus 2. For example, when discussing using the definite integral to calculate volumes of solids, a review of the structures and properties of the definite integral can provide a review of prerequisite material to prepare students to apply this content to find volumes of solids. Additionally, a longer section could benefit from having more than one instructor by having two co-instructors. The co-instructors could both provide lecture and facilitate interactive discussions by having the students’ work problems during class time. Possibly, spend most of class time working problems and engaging with the students.

The mathematics department can require Calculus 2 instructors to use more active learning and engaging teaching strategies to keep the students motivated in the content material instead of
teaching in an expository manner. There are many different pedagogical forms of active learning in mathematics that are specifically designed to help remove any barriers students might have with learning the content. As a collective reform for the mathematics department, requiring active learning can certainly increase the learning and success of transfer students in Calculus 2 (Norton, et al., 2020, 2017). Moreover, allow students to use a basic scientific calculator on quizzes and exams as research suggests that calculator usage increases self-efficacy (Kohler, 2010). Ensure all mathematics tutors in the tutoring centers or math success centers are qualified to tutor Calculus 2 and ensure there are enough tutors employed at these math success centers. This could be done by requiring prospective tutors to have a certain amount of upper-level mathematics hours or require an assessment of their knowledge on the content in their prospective course to tutor. Lastly, I recommend mathematics departments at R1 institutions specifically to have a mathematics success center that caters specifically to undergraduate students and a sector of this mathematics success center that focuses specifically on the calculus. Having a specific sector for the calculus can show transfer students that the R1 cares about their success and remove any negative perceptions about feeling insignificant as a transfer student.

Although, the focus of this study was not directed at curriculum reform or development of Calculus 2, my study did reveal students’ difficulty with understanding concepts in Calculus 2. Particularly, concepts of finding volumes of solids by revolutions and other integral techniques. I would recommend a reform of the calculus curriculum, with an emphasis on Calculus 1 and Calculus 2. As discussed in the literature review, both Calculus 1 and Calculus 2 are difficult courses for students due to the curriculum. I ascribe to the curriculum proposed by David Bressoud (2019). That is, the historical development of the calculus started with the notion of “areas” leading to the development of Integration. A concept taught in Calculus 1 to find the net area of a region
bounded by the curve of a function and \( x - \text{axis} \). Bressoud (2019) recommends starting Calculus 1 with teaching the concept of Integration instead of starting at “Limits” and “Derivatives”. This work suggests students would understand the concepts in the calculus better by following the historical development of the calculus. If we reform the curriculum for Calculus 1 to start with Integration, then this could completely alter and restructure the curriculum of Calculus 2. This would include a complete emphasis of the concepts of “Sequences & Series” at the beginning of Calculus 2, which leads logically to the development of the “Limiting Process” and follows the development of “Instantaneous Rate of Change” commonly referred to as the “Fluxion or Derivative” (Newton, 1736). Of course, the curriculum reform of Calculus 1 and Calculus 2 would require extensive peer reviewed research.

**Transfer Student Programs**

Transfer student programs at R1 institutions should provide as many resources as possible for transfer students to have a smooth transition to the academic and social environment. Participants of this study described feelings of being behind, not accepted, isolated, and feeling overwhelmed with academic integration at the R1 as factors that were attributed to their transfer status. Institutional programs can help mitigate systemic barriers that contribute to these feelings transfer students identified.

- Transfer Student Programs can mitigate these pessimistic feelings by assuring transfer students their worth and proving the institution has strategies and plans in place to remove embedded systemic barriers.
- Institutions and/or Academic departments can hire mentors titled “Transfer Student Advocate” (TSA) that mentor transfer students during their first semester at the R1 to help them successfully integrate in both academic and social environments. The
role of the TSA can provide resources, mentor and advise academically, and coordinate social activities for new transfer students at the R1.

- The TSA can employ the help of assimilated transfer students as peer mentors for new transfer students. Peer mentors can assist TSA’s with the process of assimilating new transfer students into the academic and social environments.

Transfer students from community colleges tend to have experience with smaller campus sizes and R1 campus sizes tend to be much larger and navigating usually requires a map. The TSA of these on campus programs can provide digital or online resources to help the transfer students navigate the campus and find all avenues of support available to them. Transfer students planning to enroll in Calculus, should be encouraged to attend as many help sessions or calculus review sessions as possible or that are available at the institution. Guide the incoming transfer students to resources that review basic calculus concepts.

Additionally, require incoming transfer students to take an orientation class that provides information about the campus, supports, resources and explain the theoretical constructs of transition frameworks. Introduce transfer students to Schlossberg’s Transition Framework to help transfer students see a psychological interpretation of the transition process and to see the coping mechanisms that might be available to them cognitively and physically. This could be achieved by discussing the framework in an orientation course for transfer students that are offered by R1 institutions. I would spend several classes covering the phases and aspects of the framework. Have the transfer students identify and write down all the coping mechanisms they are aware of to rely on during their transition. Knowing the coping mechanisms that are available during a transition can relieve ambiguity, because often during transitions the ambiguity adds to the anxiety which can negate all the positive attributes to successfully complete the transition.
7.5 Recommendations for Future Work

This study gives an investigation into the lived experiences of 11 transfer students in Calculus 2 at R1 institutions. The themes and sub-themes that emerged give some insight into the perceptions and reflections the transfer students have about their transition experience in Calculus 2. However, my study did not reveal any aspect of the transition of knowledge. My study revealed that transfer students perceive their transition as feeling unprepared for Calculus 2 and insignificant as a transfer student and their initial institution that they transferred from as lacking the quality of the R1 institution. The participant’s felt their Calculus 1 course did not prepare them adequately for Calculus 2 at the R1. A future study could investigate this theme further by exploring the transfer of knowledge for concepts in the Calculus 1 curriculum as a transition to the concepts in Calculus 2. For example, the transition of the conceptual knowledge about the definite integral to their conceptual understanding of using the definite integral to calculate the volume of a solid of revolution or the surface area of a solid of revolution, which are typical concepts taught in the Calculus 2 curriculum. Another study could explore traditional students’ perceptions of their transition and investigate if there exists a correlation with the perceptions of transfer students. One might conclude that every student feels unprepared for Calculus 2, but how do they feel unprepared? The study could focus on traditional students’ feelings of preparedness for Calculus 2 compared to transfer students’ feelings of preparedness for Calculus 2. The study could explore the emergent Theme 1: Feels Unprepared to Calculus 2 by comparing transfer students at the R1 feelings with non-transfer students’ feelings. This study alluded to one case of this comparison. The interview with Brian revealed that he felt prepared for Calculus 2 at a R1 institution given he completed Calculus 1 at a R1. It would be interesting to investigate this case further.
As the literature review revealed, there is not a lot of literature in the field of Mathematics Education that focus on student experiences in Calculus 2. Most of the literature tends to focus on Calculus 1. Another study could compare the quality of the teaching of Calculus 2 at the community college and R1 institutions, because my study showed that transfer students believe their Calculus 1 course at the non-R1 or community college did not prepare them for Calculus 2 at the R1, so a future study could qualitatively compare the teaching of Calculus 2 between the two institution types. The participants emphasized the difficulty of the content in Calculus 2, the faster pace of Calculus 2 at the R1, and the feeling of being behind in Calculus 2. What aspects of the curriculum in both Calculus 1 and Calculus 2 are missing that make Calculus 2 a harder course? Should the curriculums be redesigned? Another study could explore redesigning the curriculums of Calculus 1 and Calculus 2 to relieve the feelings of being overwhelmed and behind. For example, I think more applications of the definite integral, usually covered in Calculus 2, could be integrated in the sections of the definite integral in Calculus 1. We spend much time developing the concepts of the Riemann Integral in Calculus 1 from a theoretical aspect and completely neglect applications in Calculus 1. This could prepare Calculus 2 students further by having them understand some applications prior to a complete chapter of applications that are typically taught in a Calculus 2 course.

From my positionality as a mathematics educator, and as someone that has taught the calculus at both community college and R1 institutions, I believed I prepared my community college transfer students in Calculus 1 for Calculus 2 at the R1. Another study could explore the beliefs of community college mathematics instructors about their student’s preparedness for taking calculus or higher mathematics at the R1 institution. This study could be conducted by employing
an explanatory mixed methods research design with surveys to measure beliefs and follow up with
interviews to help explain the belief results.

7.6 Conclusion & Final Thoughts

This study began its origins several years ago when I was teaching at calculus at community
college and teaching Calculus 1 at the R1. My students at the R1 informed me they would not be
taking Calculus 2 at the R1 and instead opted to transfer to a community college to complete
Calculus 2. Furthermore, some of my community college students seemed eager to transfer to an
R1 and start their journey, but some of my community college students were absolutely terrified
of transferring to the R1 and enrolling in Calculus 2 there. In fact, I’ve had transient students in
Calculus 2 at the community college that were only taking Calculus 2 while they were enrolled at
the R1. These experiences as an instructor led to my interests in understanding the fear of Calculus
2 and investigating the lived experiences of transfer students in Calculus 2 at a R1.

This study presents some insights into transfer students experiences in Calculus 2 at the
R1. However, my work is the start of a discussion and I advocate for further research into the
teaching and learning of Calculus 2. I advocate for the removal of the detrimental and absolutely
discouraging term “weed out” from an association with Calculus 2, I advocate for the abolishment
of any irreverence towards transfer students, and I advocate for the equity of all transfer students
at the R1 institution. I would argue to even drop the qualifier “transfer” from the population of
students that begin college at a non-R1 and decide to pursue further academic studies at a R1. Even
if the qualifier “transfer” cannot be removed, since it is so accustomed in educational and
pedagogical vernacular, then I would advocate for a minimal use of the word. Give them the same
equity as students who began their academic pursuits at the R1. In addition, I would highly
recommend a serious reform of the curriculum to incorporate the teaching of calculus concepts
correlating to the historical development and discoveries of the calculus. This study has given me a further appreciation for my students, no matter where their academic journey began, as well as an appreciation for the utmost effort, determination, and optimistic perspective I encountered with the research participants of my study.
Appendices
Appendix A – Recruitment Email

Subject: Participate in Dissertation Study Discussing Your Calculus 2 Experience at Clemson and Earn $20 Amazon Gift Card

Body: Good Morning!

My name is Steven Edalgo, and I am a graduate student working with Dr. Karen High in the Department of Engineering and Science Education at Clemson University. We are conducting a study about transfer student perceptions and sense making of their transition in Calculus 2 as part of my dissertation study. The purpose of this study is to obtain information about student’s experiences in and perceptions of Calculus 2 at Clemson University. I am inviting you to participate because I am interested in hearing your thoughts and giving you a voice in your transitional experience as a transfer student at Clemson University.

Your part in this pilot study will include a one-on-one interview that will be audio recorded and video recorded through Zoom. I will ask you about your transfer experiences and transitional experiences in Calculus 2 at Clemson University. The interviews will take about 60 – 80 minutes. We will provide you with a $20 Amazon gift card after the interview as a thank you for your time. Please email me no later than February 28, 2022, if you would like to participate.

Important: If you have taken Calculus 1 at a community college or 4-year college, you were a full-time student or part time student at a community college or 4-year college, and now a full time or part time student at Clemson University please consider participating in this study. Your voice as a transfer student will contribute to giving attention to transfer students at Clemson University in the Mathematics Department! If you are interested in participating in this exciting study or have any questions or concerns, please contact me, Steven Edalgo, at sedalgo@g.clemson.edu or Dr. Karen High at, khigh@clemson.edu.

I appreciate your time and look forward to hearing about your experiences! Thanks!

Best Wishes,
Steven Edalgo | Ph. D Candidate
Appendix B – Consent Form

Information about Being in a Research Study Clemson University

Exploring How Transfer Students Perceive Their Transitional Experience in Calculus 2

KEY INFORMATION ABOUT THE RESEARCH STUDY
Karen High is inviting you to volunteer for a research study. Dr. High is a professor in the department of Engineering and Science Education at Clemson University conducting the study with Steven Edalgo for his dissertation work at Clemson University.

Study Purpose: The purpose of this research is to understand transfer students’ perceptions of their transitional experiences in Calculus 2 at Clemson University.

Voluntary Consent: Participation is voluntary, and the only alternative is to not participate. You will not be punished in any way if you decide not to be in the study or to stop taking part in the study.

If you decide not to take part or to stop taking part in this study, it will not affect your grade in any way.

Activities and Procedures: Your part in the study will be to participate in a one-on-one interview that asks questions about your previous Calculus 1 experience at your transfer institution and your transitional experience into Calculus 2.

Participation Time: It will take you about 60 to 90 minutes to be in this study.

Risks and Discomforts: We do not expect any risks or discomforts to participate in this study.

Possible Benefits: You will benefit by participating in this study by receiving a $20 Amazon gift card. In addition, you will help contribute to the voice of transfer students at a large land grant institution to inform mathematics departments the need for further attention to transfer students.

EXCLUSION/INCLUSION REQUIREMENTS
In order to participate in this study, you will have to be a transfer student that is currently enrolled in Calculus 2 at Clemson and transferred Calculus 1 credit from a smaller institution in the United States.

CLEMSON UNIVERSITY TITLE IX POLICY
As responsible employees under Clemson University Title IX policies, we are required to report incidents of discrimination based on sex, sexual harassment, or sexual violence involving a member of the Clemson University community.

INCENTIVES
You will receive a $20 Amazon Gift Card if you successfully participate in the entire interview.

AUDIO/VIDEO RECORDING AND PHOTOGRAPHS
The interview will take place on Zoom, and it will be recorded using the Zoom record function. In addition, the interview will be recorded using a voice recording device on an iPhone. No identifiable information will be revealed about you from the recordings. Only the researcher in this study will have access to the video recording. Your names will be given a pseudonym to protect your identity completely. Recordings will not be publicly shared in any way.

EQUIPMENT AND DEVICES THAT WILL BE USED IN RESEARCH STUDY
Zoom will be used for the interviewing process. A laptop will be used, and an iPhone will be used for voice recording.

PROTECTION OF PRIVACY AND CONFIDENTIALITY
The results of this study may be published in scientific journals, professional publications, or educational presentations. Your identity will be completely protected during the process of reporting any results of this study. No identifiable information will be present in any of the reporting of results. The information collected during the study could be used for future research studies or distributed to another investigator for future research studies without additional informed consent from the participants or legally authorized representative.

Identifiable information collected during the study will be removed and the de-identified information could be used for future research studies or distributed to another investigator for future research studies without additional informed consent from the participants or legally authorized representative.

CONTACT INFORMATION
If you have any questions or concerns about your rights in this research study, please contact the Clemson University Office of Research Compliance (ORC) at 864-656-0636 or irb@clemson.edu. If you are outside of the Upstate South Carolina area, please use the ORC’s toll-free number, 866-297-3071. The Clemson IRB will not be able to answer some study-specific questions. However, you may contact the Clemson IRB if the research staff cannot be reached or if you wish to speak with someone other than the research staff.

If you have any study related questions or if any problems arise, please contact Steven Edalgo at Clemson University by phone at (864)-656-7148 or preferably by email at sedalgo@g.clemson.edu.

CONSENT
By participating in the study, you indicate that you have read the information written above, been allowed to ask any questions, and you are voluntarily choosing to take part in this research. You do not give up any legal rights by taking part in this research study.
Appendix C – Calculus 2 Coordinator Email

Subject: Help with Recruiting Participants for Dissertation Study

Body: Dear (Calculus 2 Coordinator)

My name is Steven Edalgo, and I am a Ph. D student working with Dr. Karen High in the Department of Engineering and Science Education. We are conducting a pilot study about transfer students’ perceptions of their transition in Calculus 2 as part of my dissertation study. The purpose of this study is to obtain information about student’s experiences in and perceptions of Calculus 2 at a R1 institution.

I am sending this email to request permission to recruit transfer students in Calculus 2 to participate in a one-on-one interview for a pilot study I am designing this semester. For the students’ participation in the interview, we will give them $20 Amazon gift cards. With your permission and IRB approval, I will send the students and recruitment email.

I appreciate your time and consideration.

Thanks!
Appendix D – Interview Protocol

Transfer Student Perceptions of Transition Dissertation Interview Protocol

Hi, my name is Steven Edalgo, and I am a Ph.D. student in the department of Engineering and Science Education. I am currently working on my dissertation study in the perceptions transfer students have about their transitional experience in Calculus 2 at a large land grant research institution. Over the next hour or so, I will ask you questions that are related to this topic. To give you some information from my background, I am a first-generation college student. I identify as a transfer student. My family background is Hispanic. With your permission, I would like to record this interview to facilitate notetaking and data collection purposes. The recording will be transcribed. Your identity will not be revealed in any reporting of the analysis. Your participation is completely voluntary, and you can stop this interview at any time if any sensitive material or uncomfortable material comes up.

Do you have any questions for me before we begin?

Q1 First, can you tell me a little about yourself?

Q2 Now, I’d like to ask a little about your transfer experience.
   1. Can you describe your previous college you transferred from?
   2. Can you describe your mathematics background leading up to your transfer decision.
   3. Were there any academic resources or programs you were involved with at your previous institution?
      I. Can you tell me about those further?
      II. How did you decide to become involved with them?
   4. Were there any social resources and/or programs you were involved with at your previous institution?
      I. Can you tell me about those further?
      II. How did you decide to become involved with them?
   5. Overall, how did you feel about your Calculus 1 experience at your previous institution?
      I. Can you tell me more about the experience?
   6. Describe your goals and career aspirations you have set for yourself transferring into R1.
   7. Can you tell me why you decided to transfer to the R1 institution?

Q3 Now I’d like to talk about your transition into Calculus 2 at the R1 Institution.
   4. What is your major?
      I. How did you decide on this major?
II. What math courses do you need for this major?

5. Can you describe how you view yourself as a transfer student in Calculus 2 at R1?

6. What resources, traits, or strengths do you have that you believe will contribute to a successful transition into Calculus 2?

7. Describe how your teaching modality is affecting your transition into Calculus 2 at R1?

8. Describe how your Calculus 1 experience is affecting your experience in Calculus 2 now.

9. Describe how things are going for you this semester.
   I. How are things going for you in your Calculus 2 course?

10. Describe any supports or resources you are involved with this semester.
    II. Have you received any support in Calculus 2? Tell me more about that.

11. Can you describe any academic supports you sought this semester while taking Calculus 2 at R1?

12. Can you describe any non-academic supports you sought this semester while taking Calculus 2 at R1?

13. What things or strategies are helping you be successful in Calculus 2 this semester?
    I. Describe any strategies that are helping you in Calculus 2.
    II. Describe any strategies that are not helping you in Calculus 2.

14. Can you please describe your transition experience from Calculus 1 at previous institution to Calculus 2 at R1?

15. Can you describe the resources you think are most important in helping you have a successful transition in Calculus 2?

16. Describe how you view your academic and social environments during Calculus 2?

17. Can you describe any positive or negative feelings you have regarding any resources such as your characteristics or attributes, supports you receive or sought, strategies you are taking or not taking, or the situation you are experiencing in Calculus 2 at the R1 institution?

18. Have your goals or career aspirations changed since taking Calculus 2? If so, why?

Q4. Research Questions

19. How do you perceive and make sense of your transition into Calculus 2 at R1?
20. Describe how you reflect and understand your transition experience in Calculus 2.

21. Explain what you attribute your success or lack of during your transition in Calculus 2 at R1.

Q5. Conclusion

22. Do you have any questions for me?
23. Would you like to say any more about your experiences in Calculus 2 at the R1? If yes, what would you like me to know?
24. Do you feel comfortable with all the information you shared during this interview?

I really appreciate your time sharing your perceptions of your transition experience today. This has been very helpful for me. I wish you the best of luck with your classes and of course, with Calculus 2.
Appendix E – Coding Team Bracketing Prompts

1. How do I align myself with transfer students?
2. What experiences do I have with transfer students?
3. What are my beliefs about transfer students?
4. How do I think others perceive transfer students?
5. How well do I think transfer students are prepared?
6. What are my thoughts about the Calculus 2 course at the R1?
7. How do I feel about Calculus 1 at the non-R1 institution?
8. What are my thoughts regarding transitions?
9. How do I feel about my own transition experiences?
10. Are there any other theories I believe can affect my interpretations of the data?
11. Are my thoughts with regards to Calculus at R1 Negative? If so, why?
12. What are my feelings towards coordinated vs. uncoordinated Calculus classes?
13. Are my own experiences as an instructor (student) affecting my interpretations of transfer student experiences? If so, how, and why?
14. Do I feel transfer students have a more difficult time in Calculus at the R1? If so, why?
## Appendix F – First Cycle Raw Code Organization

<table>
<thead>
<tr>
<th>Moving In - 1</th>
<th>Moving Through - 2</th>
<th>Moving Out - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Unanticipated Transition</td>
<td>2.1 Self-awareness</td>
<td>3.1 Academic and Career Goals After Calc 2</td>
</tr>
<tr>
<td>1.10 Did not feel prepared for Calc 2</td>
<td>2.1.1 Felt behind in Calc 2</td>
<td>3.10 Loss of Confidence in Calc 2</td>
</tr>
<tr>
<td>1.10.1 Missing Curriculum in Calc 1</td>
<td>2.1.2 Feels Self-Efficacy in Overall Intellectual Abilities</td>
<td>3.11 Positive view of academic future</td>
</tr>
<tr>
<td>1.10.2 Exams similar to homework in Calc 1</td>
<td>2.1.3 First Generation Student in Calc 2</td>
<td>3.13 &quot;sometimes even better that where I'm at now&quot;</td>
</tr>
<tr>
<td>1.11 Support in Calc 1</td>
<td>2.1.4 Felt unsure about self in Calc 2</td>
<td>3.14 Returning to non-R1 to retake Calc 2</td>
</tr>
<tr>
<td>1.11.1 Academic support in calc 1</td>
<td>2.1.5 “Views self as regular student”</td>
<td>3.15 Mental Health</td>
</tr>
<tr>
<td>1.11.1.a Bad academic support in calc 1</td>
<td>2.10 Negative Experience in Calc 2</td>
<td>3.15.1 Feelings of Overwhelming Despair in Calc 2</td>
</tr>
<tr>
<td>1.11.2 Social support in calc 1</td>
<td>2.10.2 Lack of Academic Interactions in Calc 2</td>
<td>3.15.2 Feelings of anxiety &amp; stress in Calc 2</td>
</tr>
<tr>
<td>1.12 Lack of Financial Support in Calc 1</td>
<td>2.10.4 “overwhelming”</td>
<td>3.16 Ideas to improve transition experience</td>
</tr>
<tr>
<td>1.13 Strategies in Calc 1</td>
<td>2.11 Positive Experience in Calc 2</td>
<td>3.17 Losing Confidence in STEM due to Calc 2</td>
</tr>
<tr>
<td>1.14 Situation in Calc 1</td>
<td>2.12 Takes responsibility for success/lack of success in the course</td>
<td>3.18 Adapting to Independence</td>
</tr>
<tr>
<td>1.14.1 Negative perception of situation due to COVID</td>
<td>2.13 Does not take responsibility for success/lack of success in the course</td>
<td>3.19 Negative Transition due to switching teaching modalities in Calc 2</td>
</tr>
<tr>
<td>1.15 Goals for STEM career</td>
<td>2.14 Positive view of Coping mechanisms</td>
<td>3.2 Positive Perception of Transition</td>
</tr>
<tr>
<td>1.17 View of Calc 2 at R1</td>
<td>2.16 Positive Transition</td>
<td>3.20 Positive view of experience</td>
</tr>
<tr>
<td>1.17.1 Negative View of Calc 2 at R1</td>
<td>2.17 Teaching Modality in Calc 2</td>
<td>3.21 Negative Experience in Both Calc 1 &amp; 2</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1.18 Financial Support in Calc 1</td>
<td>2.17.1 Prefers Face to Face Teaching in Calc 2</td>
<td>3.22 Felt Unconfident Being a Transfer Student at R1</td>
</tr>
<tr>
<td>1.19 Financial Support</td>
<td>2.17.2 Feels lack of engagement in Calc 2</td>
<td>3.23 Negative Experience Navigating Campus Resources at R1</td>
</tr>
<tr>
<td>1.19.1 Student Loans for Support in Calc 2</td>
<td>2.17.4 Perception of Teaching in Calc 2</td>
<td>3.24 Negative Experience with Registering for Calc 2 at R1</td>
</tr>
<tr>
<td>1.2 Personal Attributes/Characteristics</td>
<td>2.18 Perception of Transition in Calc 2</td>
<td>3.25 Take Calculus Sequence at Same Institution</td>
</tr>
<tr>
<td>1.20 Lack of Support in Calc 1</td>
<td>2.2 Social support in Calc 2</td>
<td>3.3 Negative Perception of Transition</td>
</tr>
<tr>
<td>1.20.1 Lack of Familial Support in Calc 1</td>
<td>2.2.1 Sought Social Support in Calc 2</td>
<td>3.32 Felt Insignificant as a Transfer Student at R1</td>
</tr>
<tr>
<td>1.21 View of R1’s Prestige</td>
<td>2.2.2 Support from friends in Calc 2</td>
<td>3.34 Making friends in Calc 2</td>
</tr>
<tr>
<td>1.22 Lack of Engagement in Calc 1 due to COVID</td>
<td>2.20 Negative Social Environment</td>
<td>3.38 Difficult Transition in Calc 2</td>
</tr>
<tr>
<td>1.23 Lack of Resources in Calc 1 due to COVID</td>
<td>2.22 Social Support Preferred</td>
<td>3.39 “Felt like I didn’t belong”</td>
</tr>
<tr>
<td>1.24 Online Math Classes</td>
<td>2.24 Interest in STEM Degree</td>
<td>3.40 “I tried my best”</td>
</tr>
<tr>
<td>1.26 Financial Decision for Transfer</td>
<td>2.25 Faster paced in Calc 2 at R1</td>
<td>3.41 “I started to feel like I belong here”</td>
</tr>
<tr>
<td>1.27 Use Calculator in Calc 1</td>
<td>2.26 Adapting to Class Size in Calc 2</td>
<td>3.5 Determination</td>
</tr>
<tr>
<td>1.28 Positive View of R1 Institution</td>
<td>2.27 Academic Environment more important in Calc 2</td>
<td>3.6 Perseverance in Calc 2</td>
</tr>
<tr>
<td>1.29 Understands Math Requirements for Major</td>
<td>2.28 Positive View of Academic &amp; Social Environments in Calc 2</td>
<td>3.7 Goals or Major Change after Calc 2</td>
</tr>
<tr>
<td>1.3 Family Background</td>
<td>2.3 Family support in Calc 2</td>
<td>3.8 Reflection of Transition</td>
</tr>
<tr>
<td>1.31 Relearn Calc 1 Content for Calc 2</td>
<td>2.30 Perception of Content in Calc 2</td>
<td>3.9 Maturity</td>
</tr>
<tr>
<td>1.32 Provide Calc 1 Supplement Prior to Calc 2</td>
<td>2.30.1 Difficult time with Content in Calc 2</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1.4 STEM Background</td>
<td>2.31 Focuses more on Social Environment in Calc 2</td>
<td></td>
</tr>
<tr>
<td>1.5.1 Negative Perception of Preparedness at non-R1</td>
<td>2.32 Situation in Calc 1 &amp; Calc 2</td>
<td></td>
</tr>
<tr>
<td>1.6 Positive experience in Calculus 1</td>
<td>2.33 Feelings toward resources in Calc 2</td>
<td></td>
</tr>
<tr>
<td>1.7 Negative experience in Calculus 1</td>
<td>2.34 Difficulty adapting to R1 institution</td>
<td></td>
</tr>
<tr>
<td>1.9 Felt prepared for Calc 2</td>
<td>2.35 Positive experience living on campus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.4.2 Provided Tutors Not Helpful in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.4.3 Sought Academic Support in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.4.4 Provided Tutors Helpful in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5 Support from Professor in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5.1 Positive view of Professor in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5.2 Office Hours Most Important in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5.3 Negative View of Professor in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.7 Support from institution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.7.1 Seeking support outside of institution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.7.2 Aware of Support at Institution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.7.3 Not aware of support at institution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.8 Lack of Support in Calc 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.9 Strategies in Calc 2</td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Topic</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>2.9.1</td>
<td>Use online resources in Calc 2</td>
<td></td>
</tr>
<tr>
<td>2.9.2</td>
<td>Lack of Study Revealed in Calc 2</td>
<td></td>
</tr>
<tr>
<td>2.9.4</td>
<td>Lack of Resources in Calc 2</td>
<td></td>
</tr>
<tr>
<td>2.9.5</td>
<td>Learning How to Study in Calc 2</td>
<td></td>
</tr>
<tr>
<td>2.9.6</td>
<td>Positive experience with academic resources in Calc 2</td>
<td></td>
</tr>
<tr>
<td>2.4.1</td>
<td>Inconsistent Tutor in Calc 2</td>
<td></td>
</tr>
<tr>
<td>2.4.2</td>
<td>Academic support in Calc 2</td>
<td></td>
</tr>
</tbody>
</table>
Appendix G – Theme 1 Concept Map

Note: Color shades indicate my interpretation of code and category levels.
Appendix H – Theme 2 Concept Map

Note: Color shades indicate my interpretation of code and category levels.
Note: Color shades indicate my interpretation of code and category levels.
Note: Color shades indicate my interpretation of code and category levels.
Appendix K – Dissertation Timeline

Pilot Study Data Collection April 2021

Refine Conceptual Framework/Research Questions August 2021

Proposal Defense November 2021

Dissertation Data Collection Jan - April 2022

Dissertation Data Analysis May - August 2022

Present Dissertation Results at XDBER Conference April 2023

Pilot Study Analysis May - July 2021

Write Proposal August - October 2021

Present Pilot Study Results SSERC Jan 2022

Present Dissertation Research Design ASEE June 2022

Writing Dissertation September 2022 - May 2023

Dissertation Defense June 2023
References


Community College Research Center (2023, 2022).


Edalgo, S., & High, K. (2022, August), Exploring Transfer Student’s Perceptions of Their Transition Experience in Calculus 2 at a Research-Intensive Institution: A


Gallagher, Eliza Dargan, "On Becoming a Graduate Student Teacher of Mathematics" (2016). All Dissertations. 1734. https://tigerprints.clemson.edu/all_dissertations/1734


National Student Clearinghouse Research Center (2023, 2022).


Rahman, M. S. (2020). The advantages and disadvantages of using qualitative and quantitative approaches and methods in language “testing and assessment” research: A literature review.


