EXPERIENCING SUCCESS: A HERMENEUTIC PHENOMENOLOGY OF SUCCESSFUL REMEDIAL MATHEMATICS STUDENTS

by

Kyle James Ireland

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

The purpose of this hermeneutic phenomenological study was to describe how students experience success in mathematics remediation at a four-year private institution in the central United States. Success in a remedial mathematics course was defined as one's completion of a required remedial mathematics course having earned an overall grade of 90% or higher. The theories guiding this study were achievement goal theory and expectancy-value theory grounded in Bandura's social cognitive theory. This theoretical framework provided a motivational framework for student success in a post-secondary, remedial mathematics course based on individual goals for completing the task, student self-efficacy beliefs, and the individual task-value beliefs towards the course. A total of 10 participants were included to describe and interpret experiencing success in a remedial mathematics course. Data-collection techniques included the Self-Description Questionnaire III items with open response prompts; audio-recorded focus group interviews; audio-recorded, face-to-face, semi-structured interviews; and audio-recorded follow-up interviews. Analysis took place through thematic isolation via data immersion by the researcher using holistic, selective, and line-by-line approaches as described by van Manen (1990). Significant themes that emerged from data analysis included: (a) previous math outcomes; (b) quality of the teacher prior to remediation; (c) emphasis on academics by influential people; (d) belief in the value of remediation; (e) belief in the value of higher education; (f) sense of community; (g) change in attitude; (h) motivation due to mastery and performance; (i) quality of instructor; (j) exhaustion of available resources; and (k) persistence.

Keywords: mastery goals, performance goals, self-efficacy, utility, remedial education, mathematics.

Dedication

I would like to dedicate this work to wife, Darcy, and my daughters, Capri and Carsyn. Darcy, you sacrificed so many hours, days, and months to allow me to spend hours, days, and months in my office working on this study. You will never know how much it has meant to me to travel this journey with you by my side, allowing me to vent, talk about my topic, and basically drive you crazy. I love you and feel blessed to have you as my wife and best friend. To my girls, Daddy is finally done. I love you two so much! I hope I have shown you that hard work can pay off.

To my parents, Tom and Jan Ireland, thank you for all the encouragement, pep talks, and unabridged prayers. You instilled in me my hard work and discipline. Thank you for always being there for me, even when you didn't know what to say or how to help. I love you!

Finally, I want to dedicate this work to my good friend, Carl Fletcher, who passed unexpectedly in the fall of 2015. Carl, you were a great friend, an amazing husband to Camille, and a selfless father to Caitlin, Camryn, Carly, and Cara. I miss you so much. I would have loved seeing you complete your Ph.D. Therefore, I share this accomplishment with you, Dr. Fletcher. Rest in peace my brother.

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"Do not be anxious about anything, but in every situation, by prayer and petition, with thanksgiving, present your requests to God" (Philippians 4:6, New International Version). Thank you to my Lord and Savior Jesus Christ who I humbly approached in prayer and petition regularly through this process. You were faithful and always will be. Although I was at peace with the possibility of not reaching this goal if it wasn't Your will, I am so grateful You walked me through it. Praise be to Your name!

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List of Abbreviations

American College Testing (ACT)

Achievement Goal Theory (AGT)

Common Core State Standards (CCSS)

Expectancy-Value Theory (EVT)

Grade Point Average (GPA)

Institute for Positive Psychology & Education (IPPE)

Institutional Review Board (IRB)

National Center for Educational Statistics (NCES)

National Postsecondary Student Aid Study (NPSAS)

No Child Left Behind (NCLB)

Organisation for Economic Co-Operation and Development (OECD)

Programme for International Student Assessment (PISA)

Scholastic Assessment Test (SAT)

Self-Description Questionnaire III (SDQ III)

Social Cognitive Theory (SCT)

The Elementary and Secondary Education Act (ESEA)

United States (US)

CHAPTER ONE: INTRODUCTION

Overview

Given the number of students requiring remediation at the post-secondary level, a significant number of students are requiring mathematical remediation prior to studying college level mathematics. As reported in 2012, 51.7% of students who enrolled in a community college required remediation, as did 19.9% of students enrolled in four-year institutions (Complete College America, 2012). The National Center for Education Statistics (2014) supported the data collected by Complete College America through the National Postsecondary Student Aid Study (NPSAS: 12). The NPSAS: 12 indicated 13.1% of all post-secondary, first- and second-year undergraduates enrolled in a remedial mathematics course during the 2011-2012 academic year. Approximately 95,000 undergraduate students participated in the NPSAS, indicating that 12,445 of those students required mathematics remediation (National Center For Educational Statistics [NCES], 2014). As students continue requiring remediation, remedial mathematics instructors are looking for ways in which to motivate their students towards academic success. The purpose of this hermeneutic phenomenological study is to describe the essence of the lived experience that successful students have in a remedial mathematics course. Chapter One introduces the research problem and research questions, and provides a discussion of the significance of this study.

Background

As enrollment continues to steadily increase at post-secondary institutions (NCES, 2015), so do the number of students in need of mathematics remediation (NCES, 2014). This trend appears to be in part due to the mathematics performance of high school students in the United States (US) who perform at lower levels in comparison to their peers from other nations (OECD,

2012). The need for remediation is costly and time consuming for the student, but also can be beneficial for those students who succeed (Noble & Sawyer, 2013). To be successful, remedial mathematics students must be motivated to do so (Aldhafri & Alrajhi, 2014). Motivation to succeed is impacted by several variables such as one's environment, peers, self-efficacious beliefs, and reasons for completing the task (Ames, 1992; Bandura, 1986; Wigfield & Eccles, 2000). Students must succeed in mathematics remediation so that they can enroll in their college-level degree that requires a mathematics course, but a majority of those students who pass mathematics remediation fail to complete the subsequent course (Complete College America, 2012).

Enrollment Trends in the United States

Undergraduate enrollment in the US has been on the rise since 1970 (NCES, 2015). Although trends have differed over the last five decades, the overall enrollment at degree-granting institutions has steadily increased. Between 1970 and 1983, undergraduate enrollment increased 47% and reached 10.8 million (NCES, 2015). Further, although enrollment dipped slightly between 1984 and 1985, enrollment increased each subsequent year from 1985 to 1992. Enrollment steadied during the 90s; however, enrollment rose 24% (from 14.3 million to 17.7 million) between 2002 and 2012 (NCES, 2015).

Every year, students seek enrollment at post-secondary institutions needing remediation to address skill deficiencies in mathematics (Bahr, 2012). Therefore, students continue enrolling in remediation courses at both two-year public institutions and four-year public and private institutions (NCES, 2013). Those percentages of students needing mathematics remediation enrolled at four-year public institutions and at four-year private institutions were 11.9% and 6.1%, respectively, during the 2011-2012 academic year (NCES, 2014).

US Mathematics Achievement Trends in Comparison to Other Nations

High school students in the US are continuing to perform at lower levels than those of their peers in other nations. This was confirmed via the use of the Programme for International Student Assessment (PISA), in 2012. According to the 2012 PISA, 15-year-old students in the US ranked 27th out of 34 countries involved with the Organisation for Economic Co-operation and Development (OECD) by performing at below-average achievement in mathematics (OECD, 2012). Further, weaknesses were apparent in specific areas such as the ability to apply appropriate mathematical content situationally, interpretation of real-world scenarios, and mathematical literacy tasks requiring higher order thinking (OECD, 2012). Fifteen-year-olds were assessed internationally again through the 2015 PISA where the OECD mean score in mathematics was 490. Students from the US again scored below average in mathematics achieving an average score of 470 (OECD, 2016). According to Delsiver (2017), the US ranked 38th out of 71 countries in mathematics for those countries involved in the PISA assessment and 30th out of the 35 OECD members. Therefore, the US dropped three places in 2015.

Remedial Success and Cost

Research has shown that a significant amount of students, 25.6%, who enroll in mathematics remediation are unsuccessful (Complete College America, 2012; George, 2012). Yet, remedial education is focused on specific skill deficits using educational approaches to address specific student needs (Arendale, 2005; Dotzler, 2003). Boylan (1999) defines developmental education as programs designed to help underprepared students succeed in higher education through tutoring, special academic advising, comprehensive learning centers, and remediation courses. If the sole focus of remediation (which is included in developmental education) is addressing skill deficiencies, why do so many students fail to succeed? Because of

this, developmental education that is meant to provide success towards university level courses, appears to be failing at increasing student ability, while simultaneously increasing students' debt and consuming their time.

Given the impact that developmental education has on student time, debt, and financial aid eligibility, the implications regarding student success in remedial mathematics classes is of the utmost importance. However, Noble and Sawyer (2013) found that students who were highly successful (e.g., received an A) benefited from their need for developmental courses. Therefore, it is necessary to understand what influences remedial mathematics students who are successful and how their goals for achievement, mathematics self-efficacy, and course value affect their overall success.

Motivation and Remedial Mathematics

According to Aldhafri and Alrajhi (2014), motivation is a significant factor in all students' lives affecting both classroom behavior and future success. Further, student motivation in remedial mathematics is necessary for success in future college-level mathematics courses (Canfield, 2013; Howard & Whitaker, 2011). Given that understanding student motivation is both vital and the most direct predictor of student performance and achievement, student motivation is where teaching and learning can have the greatest impact (Middleton, 2013).

Motivational Theories on Success

Social cognitive theory (SCT) bases human motivation on the premise that individuals are driven by intrinsic and extrinsic motivation in addition to personal factors and the environment. According to Bandura (1986) intrinsic motivation, extrinsic motivation, personal factors, and environmental factors influence each other and help determine each individual's motivation. Individuals are influenced by incentives and those incentives determine whether

motivation is internally or externally developed. Extrinsic motivation is developed through the aide of external influences, whereas intrinsic motivation develops through individual mechanisms of self-evaluation and self-efficacy (Bandura, 1986). Motivation, whether intrinsic or extrinsic, is the catalyst that drives people to achieve their personal and academic goals. In describing and interpreting the experience of success in remedial mathematics, this research seeks to discover what factors—internal or external—motivate students to succeed.

Achievement goal theory (AGT), a prominent theory in student motivation towards success, was formed out of the social cognitive framework developed by Bandura (1986). AGT is organized by two types of achievement goals: mastery and performance (Alkharusi, 2010). Mastery goals develop competence and learning, while performance goals focus on outward competence or one's comparison to others (Ames, 1992; Dweck, 1986; Nicholls, 1984). Given that the purpose of this study is describing why remedial mathematics students are successful, student goals (mastery or performance) must be explored to help to explain the motivation to succeed. Additionally, student success expectations, course value, and self-efficacy can have an impact on student motivation and course outcomes (Wigfield & Eccles, 2000).

Expectancy-value theory (EVT) relates achievement choices to a person's ability beliefs in the present and their expectancies for the future (Wigfield & Eccles, 2000). Students who attribute success to ability reap the benefits of positive motivational consequences, yet those who contribute failure to lack of ability experience negative consequences. Therefore, central to EVT are one's ability and expectancy beliefs. Within Wigfield and Eccles (2000) model of EVT, lie components of achievement, which include: attainment value (defined as the importance of doing well on a task), and intrinsic value (the enjoyment gained from performing a task). Further, EVT considers utility value—the usefulness of the task and how the task fits into one's

future plans— and cost, referring to the necessary effort required to complete the task whether physical or emotional (Wigfield & Eccles, 2000). This research seeks to determine, through participant self-descriptions of their experience, how self-efficacious beliefs and utility of the course motivated them to succeed.

Regardless of the motivational theory, student motivation is a factor in why students do or do not succeed at completing mathematics remediation (Duranczyk, 2007; Edwards, 2010; Canfield, 2013; Howard, 2008; Howard & Whitaker, 2011; Li et al., 2013). Awan, Noureen, and Naz (2011) define motivation, generally, as an internal stimulant that directs and maintains behavior. Lack of motivation in students can cause a large setback for learning and is often a main cause of poor academic standards (Awan et al., 2011). Furthermore, if students take both their motivational beliefs and self-regulated learning strategies into account with their study behaviors, they can increase the possibility of their success (Kesici & Erdogan, 2009). Given the importance of motivation in learning and the high number of students needing mathematics remediation, understanding those factors that students attribute to their success in remedial mathematics courses is necessary.

Remedial Success is a Necessity

Student success in remedial mathematics courses is necessary to progress towards a college-level, degree-requiring, mathematics course. According to Complete College America (2012), 74.4% of students complete remediation at four-year institutions, yet only 36.8% complete remediation and the subsequent required college level course in two years. Further, more than 60% of students who need remediation take longer than two years to complete the mathematics sequence necessary to meet graduation requirements. Students requiring remediation in mathematics must adopt new skills, strategies, and habits that will lead them

towards success in these courses. Students who have previously been successful in mathematics remediation can provide relevant and valuable insight into the actions that remedial mathematics students must take to promote success. An investigation with the purpose of determining why remedial mathematics students are successful will provide students, also faculty, and staff valuable information regarding course curriculum, delivery, and structure that can lead towards higher success rates among those students requiring remediation.

Situation to Self

My interest in this research stemmed from the nine years that I spent as a professor of remedial mathematics. Empirical and anecdotal knowledge from my own experience had left me with questions about student motivation, or lack thereof. I noticed that the small percentage of students completing mathematics remediation with high levels of success in comparison to the large percentages of student completing or failing to complete mathematics remediation with low levels of success. Because of the small percentage of highly successful students, I made changes in the curriculum, instruction, and homework delivery. I began the use of a computer-based homework system allowing me to incorporate time requirements for students outside of the classroom for practice on course concepts, unlimited access to homework assignments, and smaller amounts of material per assessment. Further, I provided video lectures that corresponded with course lectures and review sessions in class prior to exams. However, I saw just a small amount of evidence that these changes influenced my students' motivation or success rate.

I have always believed that hard work and persistence leads to success. In my courses, some students only considered themselves to be successful if they earned an A in the course. But, I frequently found other students considered themselves successful as long as they passed the course. My personal stance is that success lies in the individual student's effort, yet simply

passing a developmental course does not guarantee success in the subsequently required, credit-bearing mathematics class. Students who earn a passing grade by putting forth a full effort to understand and conceptualize course concepts may have been successful in building self-confidence and self-worth. Yet, the solid knowledge base needed for success in the mathematics class required by their major of choice may not have been attained. Unfortunately, I found that these students often struggled in the next course. Conversely, others just wanted to "get through" the class. Their only motivation was to "get this class over with" and move on. Because of this, I wanted to know why few students with whom I have worked choose to persist, focus on mastering concepts, and seek full understanding of the concepts taught throughout the semester. Additionally, for those that did work to truly understand course concepts without high success, I wanted to determine what habits aided them in gaining greater success.

Describing why students are successful in a remedial mathematics course lead into the purpose of this research. Based on anecdotal knowledge, I believed that most students taking remedial mathematics were performance goal oriented (i.e., motivated to simply complete the course, earning a passing grade) and move on to the next mathematics course required for their chosen major. Further, I believed students often found no value in the course material, which inevitably lead to low levels of motivation to succeed. Finally, students often displayed low mathematics self-efficacy, which set them up for failure from day one of the class. These student beliefs can be defined through EVT where low levels of motivation occur due to perceived ability and difficulty of the task (Wigfield & Eccles, 2002).

I hoped to glean important information about students' motivation towards success, whether student motivation is based in a need for knowledge of course content, or if the motivation is based in the simple fact that passing the course is required. Multiple views

provided by study participants allowed me to gain a more comprehensive vision of how successful students described their success in remedial mathematics courses, as well as how they navigated academically through the course.

Being pragmatic by nature, my focus with this research was to determine practical applications for student success and increased motivation. I wanted to take the practical aspects for success found through the research and provide implications for students, faculty, and staff whose work surrounds remedial mathematics education. Additionally, I was concerned with what works for successful students and finding insight that can help correct a high percentage of students who failed. My belief was that research pertaining to success will provide information that will help to address the motivational issues that lead to poor performance in remedial mathematics courses.

As an educator, I have developed my own philosophical assumptions regarding how students learn and what pedagogical processes work best. These philosophies shaped my research inquiry and guided my interest in helping add to the volume of research already conducted in remedial mathematics success. Further, given my empirical and anecdotal knowledge via several years of teaching remediation, the idea of student success—particularly completing mathematics remediation—was of the greatest interest to me.

Philosophical Assumptions

My philosophical beliefs are centered on the nature of reality and are based on the idea that through a varied set of perspectives, one is able to develop a set of characteristics that exist and allow the researcher to determine a set of commonalities within the findings. According to Creswell (2013) the use of multiple realities, including several forms of evidence, allows the researcher to provide evidence for these commonalities. In the case of this research, I compiled

several forms of evidence via participants to determine commonalities that will help explain what works in successful mathematics remediation.

As the human instrument for this research, it was important to me to truly analyze and become fully engaged with the data. Epistemological assumptions require one to rely on the "subjective evidence from the participants" (Creswell, 2013, p. 21). My belief was that participants' thoughts with regard to why they succeeded were the best source for helping to explain how a student is able to be successful. Further, as mentioned by Creswell (2013), I found it important to truly understand what the participants were saying and make every attempt to meet them in the environment in which they experienced the success. Through the use of hermeneutic phenomenology, not only was I able to seek and find why participants were successful, but it also allowed me to explain their experiences through interpretation. Due to my extensive experience with remedial mathematics, I could not bracket myself by setting aside my experiences with this topic. Therefore, I determined that my experience with remedial mathematics would, with an interpretive element, help to inform the participants' described experience.

My experience as an educator created what I believe to be a false understanding of why students fail to be successful in mathematics remediation. My impression was that too often, students fail due to lack of persistence, effort, or care. However, this may not be true at all. Yet, I believed that task value is extremely important regarding whether a student is successful in mathematics remediation. My axiological assumptions forced me to conclude that in most cases, unsuccessful students simply didn't care about the material, and neither did they see the importance in understanding content. Therefore, my research was affected by these assumptions, given that I personally see algebraic thought and understanding as an essential aspect of life,

especially in one's ability to problem solve. Therefore, although biases are present, my goal was to garner only what was determined through the participants' descriptions of their success.

Research Paradigm

Although I knew that solutions to the problem of success in mathematics remediation are complex, my goal with this research was to determine possible solutions to the large number of students who do not succeed. In this way my approach, or the paradigm from which I conducted this research, was pragmatic As mentioned previously, I was concerned with what works for those students who are highly successful and those commonalities in the outcomes that can point others and myself towards pedagogical strategies and curricular approaches that lead to greater student success. I saw value in the practical implications of this research when incorporated in all levels of mathematics remediation. Further, I sought possible answers to strategies and practices for students who yearn for success at a high level.

Problem Statement

Previous research regarding student perceptions of success in mathematics remediation has been conducted (Canfield, 2013; Cordes, 2014; Frame, 2012; Howard & Whitaker, 2011). This research suggested that students who are successful in remediation often had to experience failure prior to experiencing success (Howard & Whitaker, 2011), in addition to feelings of isolation, self-doubt, and negativity (Cordes, 2014). Canfield (2013) indicated that students' self-efficacy beliefs and self-concept were affected by several factors that included: dread when attending class, frustration towards instruction, and verbal persuasion from influential people (i.e., instructors). Yet, due to strong goal commitment, students who previously had been unsuccessful were able to find success in remediation (Canfield, 2013). However, more research was needed for educators to better understand how students perceive their motivation, the

importance of motivation to their success, and how students envision their success (Howard & Whitaker, 2011; Schweinle & Helming, 2011). This understanding was necessary due to lack of knowledge regarding how students view motivation and common beliefs about student motivation that seem insufficient in helping shape curriculum and instruction based on student motivation (Walter & Hart, 2009). Given the extensive list of variables influencing student motivation to succeed (Seifeddine, 2011), the lack of voice given to remedial mathematics students in research, and the need for a better understanding of why they succeed, "qualitative research is necessary to provide a full, well-rounded view of developmental education" (Cordes, 2014, p. 194), which includes mathematics remediation.

Purpose Statement

The purpose of this hermeneutic phenomenological study was to describe and interpret the experience of successful students in a remedial mathematics course. Success in a remedial mathematics course was defined as one's completion of a required remedial mathematics course, having earned a 90% or above on their first attempt with no prior remediation. The theories guiding this study were: AGT, as defined by Ames (1992), and EVT (Wigfield & Eccles, 2000) grounded in SCT (Bandura, 1986). Together, they provided a motivational framework for student success in a post-secondary remedial mathematics course, based on individual goals for completing the task, student self-efficacy beliefs, and the individual task-value beliefs towards the course.

Significance of the Study

The need for research into remedial mathematics success was apparent in the body of work recently explored concerning the various influences that affect success in these courses. Examples of student success research in developmental courses include faculty perceptions of

student placement, factors that hinder student success (Zientek, Schneider, & Onwuegbuzie, 2014), and variables that effect student success such as self-efficacy beliefs, previous course difficulties, and class attendance policies (Zientek, Yetkiner Ozel, Fong, & Griffin, 2013). However, these two studies only provided a glimpse into the research that has been conducted regarding student success in remedial mathematics courses. Research focused on faculty aspects, student aspects, causal attributions, course venue (e.g., traditional, online), and student placement (Canfield, 2013; Cordes, 2014; Duranczyk, 2007; Howard, 2008; Howard & Whitaker, 2011).

While researchers have investigated student perceptions of failure (Cordes, 2014) and failure, then success (Howard &Whitaker, 2011; Seifeddine, 2011), studies focusing on successful student experiences and their motivation to succeed are limited. Howard and Whittaker (2011) focused on students who were successful, but had previously been unsuccessful, whereas Cordes (2014) focused on only the perceptions of students who were unsuccessful in a specific course model. Students in both studies indicated the effect that positive experiences had on their motivation to succeed and in their level of confidence (Cordes, 2014; Howard & Whitaker, 2011).

This study addressed the need to further investigate student success by exploring student experiences and perceptions of success in a remedial mathematics course framed in their motivation to succeed by goal orientation and their success expectancy. By coming to a better understanding of the motivational factors of successful remedial mathematics students, this research was able integrate the findings of Canfield (2013), Cordes (2014), as well as Howard and Whitaker (2011). By framing this research within AGT and EVT, students, faculty and staff will gain a better understanding of what truly influences remedial mathematics students'

motivation to succeed. Specifically, why few remedial mathematics students are highly successful due to the need for conceptual understanding, to complete a course requirement, or their own perceived mathematical ability, was a necessary query to gain a better understanding of student success.

Implications for instructing practice and student strategies are the main contribution that this research provides. Research outcomes may influence remedial instructors' pedagogical procedures and classroom structures (e.g., traditional approach, flipped-classroom, group work, etc.). Specific approaches to study and practice may be discovered that can be put into place by future remedial mathematics students leading to higher levels of success. Further, contributions to the literature regarding achievement goals, student self-efficacy, and task-utility in remedial mathematics courses may be discovered. Results of this study may provide a backdrop for new practices in remedial mathematics at the post-secondary level and in student preparation for university level course work.

Research Questions

The following research questions sought to fulfill the purpose of this study. A description of the meaning behind the experience that successful students have in a remedial mathematics course can only be determined when the questions posed relate back to the purpose. Therefore, the research questions for this study were as follows:

1. What experiences influence remedial mathematics students to succeed?
2. What beliefs influence remedial mathematics students to succeed?
3. What are the factors that motivate remedial mathematics students to succeed?
4. How do successful remedial mathematics students overcome academic obstacles?

Research question one was the focus of my investigation that I used to guide the phenomenological process seeking to reveal the essence and meaning of the experience (Moustakas, 1994). Hatch (2002) refers to this type of question as an "overarching question" that is meant to "reflect the general intent of the study" (p. 43). This question allowed for answers as to why students were successful, how they were successful, and the importance of their success. Research question two helped explain how previous experiences informed the students' beliefs and influenced their success, helping provide an overall understanding of essence of experiencing success in a remedial mathematics course. Both research question one and two helped to answer participants' achievement goal orientations (Ames, 1992), their expectancy-value for the course (Wigfield & Eccles, 2000), and a look into the myriad of factors (e.g., intrinsic and extrinsic motivation, self-efficacious beliefs, etc.) that influenced their success (Bandura, 1986).

The purpose of research question three was to begin investigating those factors that influence successful mathematics students' motivation to succeed. According to Bandura (1986), people are influenced by more than just intrinsic and extrinsic motivation. Individuals are also influenced by personal and environmental factors. Further, Ames (1992) states that achievement is gained based on specific goal orientations, mastery goals, and performance goals. Depending on the reason for attaining the goal, a person chooses the goal type. Therefore, the factors behind obtaining the goal may differ along with an individual's negative or positive thoughts. According to Wigfield and Eccles (2000), an individual's reasoning may also be influenced by self-efficacy beliefs, how they value the task, and the utility of the task. Here, an individual's performance is dependent on their current beliefs about their performance on the task, whether the task is important to them, and if completing the task will help them meet a

future goal. Research question three allowed me to investigate the factors influencing successful outcomes for remedial mathematics students, provide a framework that categorizes their goals leading to success in the course, help describe and interpret their self-efficacious beliefs, how they valued completion of the course, and how important completion of the course was to their future.

Research question four sought to determine more specific behaviors and influences aiding successful remedial mathematics students' success. Recent research indicated that environmental factors and even influential individuals (i.e., teachers) have a significant impact on remedial mathematics students' success (Bandura, 1986; Cordes, 2014; Howard, 2008). Therefore, determining those specific factors that aide in success helped to describe the experience held by the participants and provided an interpretation of what was experienced by highly successful students. Additionally, according to AGT, students who adopt mastery goals persist in the face of challenges and difficulty. Whereas students who adopt performance goals show signs of minimal persistence under the same difficult and challenging activities (Ames, 1992). Successful students may choose specific behaviors due their self-efficacious beliefs, how they value the course, and how important the course is to their future. Research question four helped explain what the expectancy-value (Wigfield & Eccles, 2000) of the course was for participants given how they overcame difficulty during the course and the behaviors they adopted to persist.

Definitions

The following list of terms is meant to inform the reader of the important terms that are used throughout this research. Due to the significance of the theory guiding this work, the definitions found in AGT (Ames, 1992), which claims motivation is based on either mastery or

performance goal orientation, and EVT (Wigfield & Eccles, 2000), which claims motivation is determined by one's self-efficacious beliefs, task value, and task utility, are provided. Also given are those terms referring to different aspects of mathematics remediation.

1. *Achievement Goals* - An achievement goal is an integrated pattern of beliefs or attributions that produce behavioral intentions through different ways of engaging, approaching, and responding to activities involving achievement (Ames, 1992).
2. *Developmental Education* - Developmental education, as defined by Boylan (1999), is an education designed to help underprepared students succeed in higher education through the use of tutoring programs, special academic advising programs, comprehensive learning centers, and developmental courses.
3. *Mastery Goals* - An individual's orientation towards developing new skills, attempting to understand their work, an increase in competence, or a sense of master achieved (Ames, 1992) driven by a motivation to learn by focusing on understanding content and a willingness to engage in the learning process (Brophy, 1983).
4. *Performance Goals* - Goals based on one's ability and individual self-worth through comparison to others and achieved success via minimal effort with a need for public recognition. Learning is only necessary to achieve the desired goal (Ames, 1992).
5. *Remedial Education* - Education focused on specific skill deficits of students and educational approaches that address these identified needs (Arendale, 2005). Education that provides a "remedy" for identified academic deficiencies (Dotzler, 2003).
6. *Self-Efficacy* - Self-efficacy is an individual's perception of their ability to accomplish a given task or one's perception of their current competence at the given activity (Wigfield & Eccles, 2000).

7. *Utility* - Also known as task-value, utility is defined by its usefulness and how it fits into one's future plans (Wigfield & Eccles, 2000).

Summary

Student success in remedial mathematics courses has become a significant topic of research in recent years (Canfield, 2013; Cordes, 2014; Howard & Whitaker, 2011). Due to the increase in necessary remediation at the post-secondary level, the need to improve success in remedial mathematics courses is essential not only to students, but also to institutions. Few students are successful in remedial mathematics courses, with only 25.6% completing remediation at four-year institutions (Complete College America, 2012). Therefore, it is necessary to explore the lived experience of those who were successful to gain a full understanding of their motivation. Phenomenology accomplishes this. This research, a hermeneutic phenomenological study that is underpinned by AGT (Ames, 1992), EVT (Wigfield & Eccles, 2000), and SCT (Bandura, 1986), provides a better understanding of student motivation towards success. Data gathered, based on the participants' successful experience, illuminated their achievement goal orientation, self-efficacious beliefs, and the importance or utility of the course.

CHAPTER TWO: LITERATURE REVIEW

Overview

The necessity for mathematics remediation research is evident in the number of students requiring it in recent years (Complete College America, 2012; NCES, 2014). The purpose of this hermeneutic phenomenological study was to describe and interpret the experience of success in a remedial mathematics course. This chapter discusses the theoretical framework for the study using AGT (Ames, 1992) and EVT (Wigfield & Eccles, 2000) grounded in SCT (Bandura, 1986). A review of the literature regarding remediation history, regarding student motivation in mathematics education, as well as perceptions of experiences with failure and success will be discussed. The current study's contribution to remedial mathematics success literature will be explored. Evidence for the need of this qualitative hermeneutic phenomenological study is provided ensuring the gap that must be addressed in remedial mathematics success research.

Theoretical Framework

Bandura's Social Cognitive Theory

Bandura's (1986) SCT provides a framework from which human motivation can be analyzed. SCT posits that people are not only driven by intrinsic and extrinsic motivation, but also, their driving force is influenced by personal factors and their environment. Each of these forces influences each other and becomes a determining factor in one's motivation. Individuals use symbolism, forethought, vicarious observation, self-regulation, and self-reflection in determining when and why they perform specific tasks (Bandura, 1986).

The influence of SCT on the development of AGT and EVT is evident in what Bandura (1986) describes as "incentive motivators." Specifically, incentive motivators determine whether a person is motivated intrinsically or extrinsically and how each of these motivation types

influence and change behavior. Extrinsic motivation affects one's self-motivation and self-direction. These variables are influenced and developed by external incentives. Yet, intrinsic interest is developed by self-evaluative and self-efficacious acts (Bandura, 1986).

In terms of EVT, SCT provides a framework for individual self-efficacy. According to Bandura (1986), a person's beliefs about their capabilities in any given function has an influence on how they behave, think, emotionally react, and experience stress. Further, there is value in a successful completion of a task for those who evaluate their own abilities accurately. Conversely, those who over-estimate their abilities suffer unneeded failure and difficulty (Bandura, 1986). EVT claims that judgment of one's capabilities determines the effort and amount of persistence in a given task. This judgment affects thoughts and emotions both positively and negatively, depending on whether the judgment of capability is towards a strong sense of efficacy or lack thereof (Bandura, 1986). Therefore, one's perceived competency in a task has a significant influence on the interest and motivation that affects successful completion (Bandura, 1986).

Task-value is an important aspect of EVT. This act of self-regulation determines for an individual whether their performance in the task matters. Individuals care little for tasks for which they perceive no significance, and therefore, put forth little to no effort (Bandura, 1986). However, the more relevant an activity is to an individual, the more likely the researcher is to observe the individual's self-evaluative reactions to the outcome. Those who evaluate their performance at a task are indicating their need to do the task well.

Self-regulation is one of the many factors that affect an individual's motivation. Self-regulation is evident in AFT where it is posited that an individual will achieve success on a given task either due to mastery goals or performance goals (Ames, 1992). Achievement is often

determined by one's completion of a task at a satisfactory level. Individuals who seek to perform a task at mastery level are challenged by those standards, and thus develop a feeling of satisfaction when achieving the mastery goal. Actions leading to mastery performance provide satisfaction to the individual and foster intrinsic motivation (Bandura, 1986). Mastery correlates directly to self-efficacy and expands individual interest in a task. According to Bandura (1986), self-efficacious beliefs lead to mastery, which over time, lead to growth and interest in the task.

Motivation to succeed is also effected by environmental variables. "The physical and social structures of situations, their material content, the expectations of others, and a host of other external factors all exert substantial influence on behavior" (Bandura, 1986, p. 243). An individual pays close attention to the behaviors of those around them in comparison to what they themselves are doing to change and adapt their own actions. Because of this, one can decipher what is considered to be an acceptable standard of performance based on the environment. Standards are adopted by individuals by modeling the behaviors of those around them. Performance goals, a subset of AGT, are based in what is adequate or common. Bandura (1986) stated when individuals examine their own behavior rationally this examination requires them to compare three areas: level of performance, personal standards, and peer performance.

Achievement Goal Theory

AGT is concerned with the concept of achievement motivation focused on the purposes of achievement behavior (Ames, 1992). As defined by Elliot and Dweck (1988), an achievement goal is sought via a distinct set of cognitive processes having behavioral consequences. Within the achievement goal framework are two specific constructs: mastery and performance goals. The need to succeed at a task is determined in AGT based on one's achievement goal orientation. One's choice of goal type, whether mastery or performance, provides differing reasons for

attaining the goal. Further, one's cognitive thoughts about themselves, the task to be accomplished, and the outcomes of the task vary significantly based on the purpose for achieving the goal (Ames, 1992).

Goals are believed to vary individual to individual with a significant number of positive and negative thought processes dependent on the choice of achievement goal (Alkharusi, 2010). The two areas of achievement motivation typically discussed are: mastery goals and performance goals. Those individuals that adopt mastery goals are believed to persist in difficulty, welcome challenges, and carry with them a high level of intrinsic motivation (Alkharusi, 2010; Ames, 1992). Further, central to mastery goals is a correlation that exists between belief and effort. As mentioned previously, a high level of intrinsic motivation accompanies mastery goals; therefore, a focus on the value of learning and a belief that effort leads to success provides an individual with a sense of mastery (Ames, 1992).

Mastery goals. Individuals who choose mastery goals are believed to have a motivation to learn (Brophy, 1983). Therefore, researchers have argued that educators should focus on quality of involvement while committing to a learning environment where the outcome of differing motivational patterns is learning itself (Aldhafri & Alrajhi, 2014; Ames, 1992; Gilbert et al., 2014; Matteson & Swarthout, 2011). With this in mind, those individuals who adopt mastery goals orient themselves towards the development of new skills, full understanding of their work, increasing their ability, and mastery achievement based on personal standards (Ames, 1992). Further, these individuals adopt patterns of success and help-seeking behavior (Alkharusi, 2010). A choice of mastery goal indicates an individual's willingness to engage and understand the content during the learning process (Ames, 1992).

Performance goals. The choice of performance goals, also described as ego-involvement goals (Nicholls, 1984), indicates one's learning focus is on ability and self-worth (Ames, 1992). On this side of the achievement goal framework, individuals base their success by comparison with others and their ability to surpass "normative-based standards" (Ames, 1992, p. 262), or by being successful with minimal effort. Further, public recognition is important to an individual who adopts a performance goal because of the need to know that the performance was superior to his or her peers (Ames, 1992). However, negative connotations are expected when individuals adopt performance goals. Persistence levels in those who adopt performance goals are expected to be minimal in the face of difficulty, challenging activities are avoided, and intrinsic motivation is lacking (Alkharusi, 2010).

According to Ames (1992) when an individual adopts a performance goal their self-worth is based upon their perceived ability to perform. Therefore, when an individual puts forth an immense amount of effort, but does not succeed, there can be a negative effect on their self-concept. However, those who have performance goals seek affirmation due to performing in a superior manner to their peers. In this case, learning is simply a means by which an individual achieves a goal, and nothing else (Ames, 1992). Evidence with performance goals indicates that when adopted by an individual, only surface learning strategies such as memorizing and rehearsing information are used. In short, performance goals do not necessarily promote conceptual understanding (Meece, Anderman, & Anderman, 2006).

Performance avoidance. Although mastery and performance goals are the main components of AGT, Elliot and Church (1997) further differentiated these goals to include performance avoidance goals. In this third component, individuals seek to avoid "unfavorable judgments of competence" (Elliot & Church, 1997, p. 218). Performance-avoidance requires an

individual to develop certain characteristics such as anxiety and task distraction through self-regulation. Development of these types of characteristics creates for the individual feelings of helplessness with regard to their efforts towards success (Elliot & Church, 1997). Elliot and Church (1997) discuss achievement motivation in one aspect as a desire to avoid failure, pointing an individual to the possibility of failure. Therefore, if one who fears failure will adopt habits that help to attain positive outcomes. Specifically, the use of performance goals, which demonstrate normative behavior and forego the chance of failure, is most likely when adopting performance-avoidance approaches (Elliot & Church, 1997).

Mastery approach or mastery avoidance. The study performed by Meece et al. (2006) discussed sub-categories of mastery goals and performance goals and stated that, individuals who choose mastery goals may adopt one of two approaches: mastery approach or mastery avoidance. Mastery approach is the central idea behind mastery goals where, as stated previously, students focus and want to learn, master, and truly understand the task at hand (Meece et al., 2006). Those who choose a mastery avoidance approach want to avoid misunderstanding and/or not being able to learn from a specific task. Performance-approach goals—those that are demonstrated by ability and outperformance of others—relate positively with persistence and achievement (Meece et al., 2006).

Given the effect that a student's achievement goals have on their motivation, it is important to understand how they perceive their ability to succeed, as well as their perceived necessity of the material being studied. A student's self-efficacious beliefs and how they value an academic task, the basis of EVT (Wigfield & Eccles, 2000), can help to further understand their motivation to succeed in mathematics remediation.

Expectancy-Value Theory

The central idea behind EVT is that an individual's choice, persistence, and performance can be explained by their current beliefs about how they will perform on an activity (i.e., self-efficacy) and the extent to which they value the activity, described as task-utility (Wigfield & Eccles, 2000). One's expectancies and values are influenced by task-specific beliefs. An individual's belief in his or her own ability is related to their expectancy for success and is focused on both present and future expectancies for success and less on the outcome (Wigfield & Eccles, 2000).

A person's motivation is influenced by ability beliefs, or self-efficacy, which is a perception of their current competence at an activity. These beliefs are different from those expectancies for success due to their focus on present ability. However, both aspects of EVT are highly related and effect one's achievement-related choices (Wigfield & Eccles, 2000).

Expectation of success. Students' expectancies for success are described as their beliefs about how they will perform on a given task, regardless of when the task takes place (Eccles et al., 1983; Wigfield, 1994; Wigfield & Eccles, 2000). Further, Wigfield (1994) adds that expectancies are also influenced by other beliefs, including achievement goals and personal schemas. These beliefs can be explained as two types of expectancies: outcome expectations and efficacy expectations (Wigfield, 1994). However, of the two types, efficacy expectations—those expectations an individual has regarding their ability to successfully complete the task—are the main expectancy beliefs utilized in EVT (Wigfield, 1994).

Expectancy beliefs are related to ability beliefs, yet they can be distinguished from each other where expectancy relates to future outcomes, and ability is based on one's current perception of competence at a given task (Wigfield & Eccles, 2000). This examination of

competence focuses on specific beliefs that an individual has about an upcoming task (Wigfield, 1994). A combination of these two related areas of belief by an individual are significantly influential on an individual's motivation towards task completion (Eccles et al., 1983; Wigfield, 1994; Wigfield & Eccles, 2000).

Task value. Atkinson and Feather (1966) described task value as motivation to an individual due to the value held, and the expected probability of success with the task. Eccles et al. (1983) expressed that because the value of task is subjective, an individual's decisions are heavily influenced by personal views. Wigfield and Eccles (2000) suggested that task value can have four individual types: utility value, attainment value, intrinsic value, and cost.

Utility value. Utility value is an individual's belief in the importance of a task for a future goal that may not be naturally related to the current activity (Eccles et al., 1983). Utility value is often related to extrinsic motivation, where students may only be motivated to complete a task because it is viewed as a necessary step in the journey towards current or future goals (Husman, Derryberry, Crowson, & Lomax, 2004). Reasons for engaging in a task, not simply for the sake of engagement, but for some desired outcome, encapsulates the idea of the utility of a task (Wigfield & Eccles, 2000). If the task is perceived as being useful, then it has utility value (Agbuga, 2011).

Given that utility value is due to extrinsic motivation, it is important to discuss the effect that intrinsic motivation also has on task value. Defined as enjoyment an individual gains from performing a task (Agbuga, 2011), intrinsic motivation has been found to be a significant predictor of task value (Husman et al., 2004). Although task value and intrinsic value are unique motivational factors in their own right, the relationship them has great influence on an individual expectancy value of a task. Because the value of a task is subjective, task value can be a

powerful influence on the academic choices a student will make (Husman et al., 2004). Therefore, a predictive relationship—like that between intrinsic motivation and task value—can have a course altering impact.

The influence of intrinsic motivation to perform a task, as well as the tasks utility, may also be impacted by the cost for performing the task. As defined by Wigfield and Eccles (2000), "cost" references the limiting power an activity has on one's participation in other activities, helping to determine if engaging in the task has worth. In other words, one evaluates the effort required to accomplish the task and the possible emotional toll that effort creates. Motivation to perform and complete a task may require more effort than an individual is willing to exert. If this is the case, then the cost is considered too high. However, if the task is worth the cost, possibly providing extrinsic motivation and having high utility, then motivation to perform the task may be high. In terms of cost, the individual evaluates the possible loss of time and energy for other more desirable choices (Agbuga, 2011). Further aligning with the intrinsic value of a task, its utility, and cost is the importance of performing the task well. This performance, influenced by core personal values and important to self-image, is what researchers refer to as "attainment value" (Eccles et al., 1983).

Summary

Theories guiding this study are SCT (Bandura, 1986), AGT (Ames, 1992), and EVT (Wigfield & Eccles, 2000). SCT provides a framework for the driving factors that influence an individual's motivation both intrinsically and extrinsically. Bandura (1986) indicates intrinsic and extrinsic motivation can be influenced by personal beliefs, self-regulation, and environmental factors. AGT builds on this, suggesting that individuals are motivated to achieve a specific goal by a choice of mastery, persisting to carry high levels of intrinsic motivation or

performance (choosing comparison to others and normative standards) (Ames, 1992). EVT bases individual motivation on one's belief in how they will perform at a task and the extent to which they value that task (Wigfield & Eccles, 2000).

Research into student experiences with mathematics remediation indicates that motivation is a significant factor influencing success (Howard, 2008; Howard & Whitaker, 2011). Failure to succeed in remediation has been investigated (Cordes, 2014), as well as success after returning to a previously failed course (Howard, 2008; Howard & Whitaker, 2011). However, research into the experience of highly successful remedial mathematics students is missing from the literature. This research sought to fill this gap by addressing the essence of experiencing success in mathematics remediation and add to the body of knowledge regarding achievement goals and expectancy in remedial mathematics success.

Related Literature

History of Developmental Education and Remedial Education

Remediation in higher education began in the 1600s and centered on Harvard University. Because 10 percent of students admitted to Harvard were from non-privileged families (Arendale, 2002), universities created admission requirements due to deficiencies in Latin and Greek. Students at both Harvard and Yale commonly received tutoring for these deficiencies (Arendale, 2002), and illiterate students at Harvard were provided reading remediation (Dotzler, 2003). By the mid-1700s, many institutions required proficiency exams in arithmetic (Arendale, 2002). As remediation progressed, many institutions required proficiency in history, geography, and English by the late 1800s. Upon admittance to Harvard, students were provided ongoing tutoring because lectures and texts were delivered in Latin. Eventually, Harvard became the first

postsecondary institution that required students to be enrolled in remedial courses (Arendale, 2002).

Admissions policies changed in the 1700s. Due to financial advantages, institutions began admitting students who were underprepared because they could afford the tuition. Institutions created segregation policies based on academic abilities, sex, and ethnicity (Arendale, 2002). The need for tutors and the growing homogeneity in the student population, due to the influx of underprepared students, pushed postsecondary institutions to offer pre-collegiate preparation in the 1800s (Arendale, 2002; Boylan & Bonham, 2007). Pre-collegiate preparation developed as an academic preparatory program, the first of which was established by the University of Wisconsin in 1849 (Arendale, 2005). By the end of the 19th century, most colleges had adopted the University of Wisconsin model (Arendale, 2005) or some form of preparatory academy teaching students reading, writing, and arithmetic (Dotzler, 2003). College preparatory programs served as substitutes for secondary education and were often located on campus or within the community (Arendale, 2005; Arendale, 2002).

As academic rigor at the postsecondary level increased, remedial education began to focus on specific academic deficiencies and instructional approaches needed to remedy students' lack of preparation (Arendale, 2005). Academic rigor increased due to addition of higher-level curriculum in the preparatory courses (Arendale, 2002). Further, libraries became the main source of knowledge, whereas previously, all knowledge was gleaned from oral recitation. By 1889, 80% of postsecondary institutions had established college-preparatory programs (Dotzler, 2003), and due to the increase in academic rigor, nearly 40% of students admitted had previously attended the same institution's preparatory academy (Arendale, 2002).

Between 1860 and 1940, remedial courses were introduced into college curricula. During this time period, college enrollment increased due to the involvement of the Federal government (Arendale, 2002) and the movement towards agricultural education established by the Morrill Act of 1862 (Duemer, 2007). The Morrill Act created a wider gap in academic preparation levels of students (Arendale, 2002), but was necessary to educate farmers and others on the efficient use of land, in addition to providing an education that they could not afford (Duemer, 2007). Following the Morrill Act, came the establishment of Historic Black Colleges (formed to educate freed slaves) (Arendale, 2002; Dotzler, 2003) and junior colleges. In 1902, J. Stanley Brown, superintendent of Joliet Township High School, and William Rainey Harper, president of the University of Chicago, opened the first community college in the country: Joliet Junior College (Arendale, 2002; Dotzler, 2003). These types of institutions were the main producers of educated minority students, and remediation became a core aspect of their curricula. Because of this, many institutions moved preparatory programs to nearby junior and community colleges (Arendale, 2002).

The introduction of remedial classes became a must for college curricula in the late 1800s. By 1907, half of all students completing the College Entrance Examination failed to earn the minimum score for admittance at Harvard, Yale, Princeton, and Columbia. Study courses became common, and institutions developed bridge programs. These short-term remedies took place one day per week and focused on reading-specific remediation (Arendale, 2002). Soon, summer bridge programs were developed to eliminate the amount of time needed to complete college, allowing students to begin completing the required curriculum prior to the start of the academic year. Bridge programs helped colleges produce quickly graduates who could serve as officers in the military during World War II, providing them with effective learning and critical-

thinking ability. Because of this approach, college-preparatory academies became insufficient due to their inability to meet the needs of a growing, heterogeneous, number of college freshman (Arendale, 2002).

Soon after World War II, developmental education became mainstream (Arendale, 2002). An increase in study skills classes where students practiced specific strategies with their course content was conducted in correlation with general education requirements. Further, courses included supplemental instruction, learning-centered focuses, and sought to determine student understanding (Arendale, 2002). These support systems moved institutions towards full-service teaching and learning centers, including students requiring and not requiring remediation. These learning centers often include academic support programs, course-instructor feedback, and learning effectiveness, and provided an enriched learning environment (Arendale, 2002).

Developmental education. Developmental education, which is geared toward the notion that all college students should be considered under development, emerged during the 1970s (Arendale, 2005; Boylan & Bonham, 2007). This comprehensive model for student support (Arendale, 2005) is a range of courses and services meant to support students in attaining postsecondary educational goals (Boylan & Bonham, 2007). With 75% of American colleges offering learning assistance programs of some type (Boylan, 1995), developmental education is meant to teach students critical thinking and support their success (Arendale, 2005; Boylan & Bonham, 2007). In summary, developmental education is seen as a comprehensive model of student support because it seeks to positively affect a student both academically and affectively (Arendale, 2005).

No child left behind. In 2002, President George W. Bush signed the No Child Left Behind (NCLB) Act into law with the intention of closing achievement gaps, developing

proficiency, and raising expectations in English and mathematics (Dee & Jacob, 2011; Guilfoyle, 2006; Shirvani, 2009; Trolian & Fouts, 2011). Although NCLB retained much of the original focus found in the Elementary and Secondary Act (ESEA) approved under Johnson in 1965, the main difference existed in the achievement gap problem, which is now solely the teachers' responsibility (Groen, 2012; Guifoyle, 2006). Because of this, teachers must focus on students' ability to excel on standardized tests, which has a significant impact on pedagogical processes and course curriculum (Dee & Jacob, 2011; Groen, 2012; Guilfoyle, 2006; Trolian & Fouts, 2011) focusing on memorization and test strategies, rather than application or comprehension (Trolian & Fouts, 2011).

The implications of NCLB on academic achievement in higher education can be observed in the number of students entering college deficient in their abilities. According to Guilfoyle (2006) schools have implemented work-arounds to raise student scores, but not student learning due to less-difficult test items, exclusion of student scores when they performed at a low level, and encouraging students to miss school on the days of the tests. The test culture that has been created produces students who are ill-prepared for the learning environment of college (Trolian and Fouts, 2011). Because of the emphasis on standardized testing, transition to college becomes difficult in that students are now solely responsible for their own schedule and application of learned skills, whereas previously, they have been told what to do and what to learn (Trolian & Fouts, 2001).

As students move into the culture of higher education, there is evidence of a disconnect that exists between their mathematics achievement prior to high school and when they enter into college. Recent research into the impact of NCLB on academic achievement indicates a significant increase in mathematics achievement amongst 4th graders and a moderate increase in

mathematics achievement amongst targeted 8th graders (e.g., low-performing students) (Dee & Jacobs, 2011). Further, the Center for Education Policy (2008) released a report indicating that state assessments in reading and mathematics achievement were on the rise since the inception of NCLB in 2002. Providing additional evidence for the positive impact of NCLB are the improved test scores from the National Assessment of Educational Progress (NAEP), which indicate NCLB is working at the earlier targeted grades (Dee & Jacob, 2011). If research indicates that students improved in their mathematical ability after the inception of NCLB, why are so many students entering higher education institutions lacking in college-level mathematics skills?

Several reasons may exist for poor academic preparation for college due to the implementation of NCLB. First, educational standards have been lowered because the need for conceptual understanding has been ignored (Shirvani, 2009). Schools have altered their curricula—setting aside normal procedures—by spending several weeks focused on previous test questions (Shirvani, 2009). Finally, because defined proficiency is provided to the state, standards have been lowered even further, allowing more students to appear sufficient than the number actually performing at an appropriate level (Shirvani, 2009).

Students entering postsecondary education, having experienced an education influenced by NCLB, required to enroll in mathematics remediation may provide insight into the beliefs and influences of success in such classes. Because schools alter schedules and spend several weeks on previous test questions (Shirvani, 2009) while increasing the difficulty of college transitions for students (Trolian & Fouts, 2011) due to NCLB, understanding the experiences and beliefs of successful remedial mathematics students is a need to further improve the success of a larger number of students. Knowing how these students have overcome the apparent disadvantage created by a culture of standardized testing is a necessary inquiry.

Common core state standards. Prior to 2010, each state individually determined academic standards at the elementary and secondary levels, causing variation to academic standards across the country (Krueger & Michelau, 2011). Therefore, in an attempt to create a universal set of academic standards across states, the Common Core State Standards (CCSS) were released in 2010 (King, 2011). CCSS introduced standards for K-12 within foundational subjects such as English and mathematics to produce college-ready high school graduates (King, 2011; Krueger & Michelau, 2011). Research by Achieve and ACT determined college success weighs heavily on core knowledge in those two subjects (King, 2011).

Implications from CCSS for higher education lie mostly in policy alignment and cooperation with the K-12 arena. According to Jones and King (2012), ongoing efforts to aid elementary and secondary education have been purposeful in strengthening student academic preparation for higher education. CCSS have defined college and career readiness by aligning K-12 and higher education goals and creating new assessments, thereby providing knowledge about student progress (Jones & King, 2012). With clearly defined goals, created by CCSS, colleges are able to further their own objectives for learning and student success and monitor the progress of the incoming students before and after admittance (Jones & King, 2012).

The effects of CCSS on mathematics achievement can be explained in how college readiness is defined. CCSS define college readiness in mathematics with an emphasis on "focus, coherence, clarity, and rigor" (Jones & King, 2012, p. 40). Higher standards for students, specifically demonstration of fluency in mathematical concepts and procedures, solving real-world problems with that knowledge, and the ability to explain and defend their reasoning, are the primary focus of CCSS (Jones & King, 2012). These standards then affect student placement due to their influence on placement criteria and institutional policies. CCSS are meant to remove

the need for remediation and provide students with the necessary skills for success in credit-bearing courses (Jones & King, 2012; King, 2011).

Although CCSS are meant to produce students who are college ready, they will also inevitably produce students with need for support. As the expectations for college readiness increase, more students will be identified as being underprepared for higher education (Jones & King, 2012). Jones and King (2012) believe that this is an opportunity for faculty and administration to partner with high schools in addressing the needs of students who are still developing academically through the use of bridge programs and dual-enrollment. However, the need for remediation will still be relevant. Higher standards in mathematics achievement, which are intended to increase preparation for higher education, will produce students who are still insufficient in their mathematical skills.

CCSS will have had an impact on higher-education students who are required to enroll in remedial mathematics. Those students may have beliefs unique to their mathematical experiences, which have influenced their secondary success and led to their remedial placement, and can provide insight. Information gleaned from them can provide educators and future remedial mathematics students with suggestions about successful mathematics remediation experiences.

A timeline for significant higher education events involving post-secondary remediation—including remedial courses, laws effecting college enrolment, and college preparatory programs—is provided in Table 1. The events are listed in chronological order, and the onset of community college and developmental education are highlighted.

Table 1

History of Remediation Timeline

Year or Period	Significant Event
1600s	Harvard University puts remediation in place
1700s	Most institutions require proficiency exams; Harvard requires freshman to enroll in remedial courses
1800s	Underprepared students
1849	University of Wisconsin establishes first academic preparatory program
1862	Morrill Act with an emphasis on agricultural education
1889	80% of post-secondary institutions established college preparatory programs
1895	Nearly 40% of all admitted college students previously attended the colleges preparatory academy
1902	Joliet Junior College is established by Joliet Township High School Superintendent J. Stanley Brown and University of Chicago President William Rainey Harper
1907	50% of students taking college entrance exam did not meet requirements at Harvard, Yale, Princeton, and Columbia
1930s	Diagnosis of reading deficiencies, classes in study skills, time management, and focus on study established
World War II	Summer bridge programs created; preparatory academies become obsolete
Post-World War II	Institutions move towards teaching and learning centers; college preparatory departments are created
1970s	Developmental education educating all college students established
2002	NCLB Implemented
2005	Approximately 75% of American colleges and institutions offer learning assistance
2010	CCSS implemented

Research in Students' Motivation in Mathematics

Recently, researchers have explored several aspects of student motivation pertaining to mathematics (Aldhafri & Alrajhi, 2014; Awan et al., 2011; Berger & Karbenick, 2011; Bulut, Koc, & Ozturk, 2007; Gilbert et al., 2014; Kesici & Ergdogan, 2009; Kim, Park, & Cozart, 2014). Mathematics motivation has been researched at various levels of education, including middle school (Gilbert et al., 2014), high school (Kim et al., 2014; Middleton, 2013; Walter & Hart, 2009), and postsecondary levels (Kesici & Ergdogan, 2009; Schweinle & Helming, 2011; Sengodan & Iksan, 2012). Further, research approaches have included online settings (Kim et al., 2014), teacher participants (Matteson & Swarhout, 2011), and participants who successfully completed their postsecondary degree (Martin, Galentino, & Townsend, 2014).

The effects of classroom environment, including teaching styles, and their effects on student motivation have been explored (Aldhafri & Alrajhi, 2014; Gilbert et al., 2014). Research indicates that a moderate relationship exists between teaching styles and intrinsic mathematic motivation in students (Aldhafri & Alrajhi, 2014). Additionally, classroom environment provided no connection to test performance, yet teacher expectations and reform practices predicted mathematics efficacy, achievement goals, and student achievement. Teacher support directly predicted mathematics utility and mastery goals, while inversely predicting performance approach and performance avoidance goals (Gilbert et al., 2014).

Research regarding student mathematical self-concept and mathematic identity, and their connection to motivation, have been examined in secondary classrooms (Awan et al., 2011; Middleton, 2013). A strong correlation between self-concept and achievement motivation exists along with gender differences where females tend to have more positive self-concept in mathematics when compared to their male counterparts (Awan et al., 2011). However, in terms

of mathematical identity, boys were found to have higher feelings of utility, self-efficacy, and mathematical interest when compared to their female counterparts (Middleton, 2013). In respect to effort, according to Middleton (2013), girls are more willing to put forth effort to be successful.

Teacher perceptions of student motivation have also been considered in recent literature. In a 24-teacher study, Matteson and Swarthout (2011), explored teacher perceptions of student motivation via six open-ended questions and an 11-item questionnaire focused on beliefs regarding student motivation and how their beliefs affected their mathematics lesson planning and teaching preparation. Researchers determined that teachers employed real-world concepts and attempted to personalize mathematical information using group work and pairing students together. Further, through the use of extrinsic motivation (e.g., tangible and verbal rewards) teachers attempted to motivate students in the classroom. However, teaching strategies that were ineffective included moving too quickly through material and talking down to students (Matteson & Swarthout, 2011).

Motivational beliefs have also been found to be significant predictors of students' mathematics anxiety (Kesici & Ergdogan, 2009). Specifically, one's anxiety related to test taking combined with their personal self-efficacy for learning mathematics has a direct correlation to their level of mathematics anxiety. Further, according to Kesici and Ergdogan (2009), a student's rehearsal and cognitive learning strategies are also predictors of their mathematics anxiety. This is further evident in research conducted by Kim et al. (2014) where students with high levels of success reported lower levels of anxiety, anger, shame, and hopelessness, yet higher levels of enjoyment and pride. Therefore, inferences can be made that

students with higher levels of self-efficacy and low test anxiety will achieve a higher level of success compared to their counterparts.

Research regarding student motivation as a predictor of achievement in mathematics has been extensive (Awan, 2011; Bulut et al., 2007; Gilbert et al., 2014; Kim et al., 2014; Middleton, 2013; Schweinle & Helming, 2011). Self-efficacy is considered a strong predictor of academic achievement in mathematics (Bulut et al., 2007; Gilbert et al., 2014). This is further supported by Kim et al. (2014) who discovered a significant relationship between final scores and self-efficacy in an online, high school mathematics course. However, intrinsic motivation, including mastery goals, was found to have no relation to academic achievement in mathematics by both Bulut et al. (2007) and Gilbert et al. (2014), whereas Kim et al. (2014) found high levels of self-efficacy related to high levels of cognitive strategy and self-regulation due to intrinsic value found in the content.

Achievement goals on mathematics achievement. A student's achievement motivation has a strong correlation with academic achievement (Awan et al., 2011). Further, one's mathematics self-efficacy is significantly correlated to achievement motivation when related to mathematics achievement (Awan et al., 2011). However, other research has indicated that one's reason for success does not significantly predict motivation, nor does motivation significantly differ due to the reason chosen by the individual (Schweinle & Helming, 2011). Yet, Walter and Hart (2009) discovered that students showed signs of personal motivation to achieve due to self-investment, enjoyment in learning, and being active in their learning experience.

Mastery goals have been largely correlated to student achievement and in some cases, are strong predictors of said achievement (Keys, Conley, Duncan, & Domina, 2012; Nasiriyan et al., 2011; Raccanello & Benardi, 2013). Phan (2014) found that a mastery approach to learning had

a positive effect on achievement. Mastery is believed to also have an indirect influence on achievement due to the effect that it has on one's effort leading to achievement (Nasiriyan et al., 2011). However, other research indicates the converse, specifically in Gilbert et al.'s (2014) research where mastery goals were not significant predictors of standardized test performance. Further, Schweinle and Helming (2011) reported that a minimum number of students provided mastery goals as a reason or motivation for their success in mathematics.

The choice of performance goals by an individual has a direct effect on mathematical success. Performance goals often predict lower achievement in mathematics (Gilbert et al., 2014; Nasiriyan, 2011). Other research has indicated that performance goals have no significant effect on mathematics achievement (Keys et al., 2012), are the main reason participants indicated they performed well in mathematics (Schweinle & Helming, 2011), and have a significant relationship with academic self-concept and changes in academic self-concept over time (Neipel et al., 2014).

Self-efficacy on mathematics achievement. Recent literature tying self-efficacy to mathematics achievement has been extensive. Research indicated that students who have positive mathematics self-efficacy found mathematics to be more valuable (Berger & Karabenick, 2011). Further, self-efficacy was found to be a significant predictor of mathematics achievement (Awan et al., 2011; Bulut et al., 2007) and positively related to students' standardized test scores (Gilbert et al., 2014). According to Kim et al. (2014) self-efficacy correlates to high levels of cognitive strategy use and self-regulation, as well as having a significant relationship with final scores.

Research showed that whether a student is successful or not can predict their level of self-efficacy (Schweinle & Helming, 2011) and that mathematical self-concept, or self-efficacy

beliefs in mathematics, provide a positive correlation with achievement and a reciprocal relationship with achievement and self-concept (Neipel, Brunner, & Preckel, 2014). In summary, self-efficacy has a direct impact on one's mathematics achievement; therefore, emphasizing the importance of self-efficacy in learning and success in mathematics (Nasiriyan, et al., 2011).

Task-value on mathematics achievement. Research regarding mathematics values and its effects on student motivation has indicated a strong relationship between mathematics utility and one's interest and attainment of the information (Berger & Karabenick, 2011; Phan, 2014). However, in Berger and Karabenick's (2011) research, students valued their mathematics less at the conclusion of the academic term. Other research indicated that high levels of a person's intrinsic value for mathematics correlates strongly to cognitive strategy use and self-regulation (Kim et al., 2014). Further, instructors described students as being more cognitively, metacognitively, and motivationally competent learners when they had high mathematical value beliefs (Metallidou & Vlachou, 2010). Yet in other research, task value did not significantly predict mathematics achievement (Bulut et al., 2007). Table 2 provides a summary of the several motivational variables and their effects on mathematics success.

Table 2

Student Motivation Variables and Related Outcomes on Mathematic Achievement

Research	Influencing Variable	Related Outcome
Aldafri & Alrajhi (2014)	Teaching style	Intrinsic motivation
Gilbert et al. (2014)	Teacher practices	Achievement goals Student achievement
Awan et al. (2011)	Self-concept Female student	Achievement motivation Higher self-concept Higher effort
Middleton (2013)	Males student	Higher utility and interest
Walter and Hart (2009)	Self-investment	Personal motivation
Kesici & Ergdogan (2009)	Motivational beliefs Cognitive learning strategies	Mathematics anxiety Mathematics anxiety
Kim et al. (2014)	High levels of success	Lower levels of anxiety
Schweinle and Helming (2011)	Success	Self-efficacy
Awan et al. (2011)	Achievement motivation	Mathematics achievement
Keys et al. (2012) Domina (2011) Nasiriyan et al. (2011) Raccanello & Bernadi (2012)	Mastery goals	Mathematics achievement
Phan (2014)	Mastery approach	Positive learning
Gilbert et al. (2014)	Intrinsic motivation Mastery goals	No relation to achievement
Gilbert et al. (2014) Nasiriyan (2011)	Performance goals	Lower achievement
Keys et al. (2012)	Performance goals	None on achievement
Neipel et al. (2014)	Performance	Academic self-concept
Schweile & Helming (2011)	Performance goals	Self-reported reason for success
Berger & Karabenick (2011)	Self-efficacy	Math is more valuable
Awan et al. (2011) Bulut et al. (2011) Neipel et al. (2014)	Self-efficacy	Mathematic achievement
Gilbert et al. (2014)	Self-efficacy	Positive standardized test scores
Kim et al. (2014)	Self-efficacy	High cognitive strategies, Self-regulation, and final scores
Kesici & Ergdogan (2009)	Self-efficacy	Mathematics anxiety
Berger & Karabenick (2011) Phan (2014)	Math utility	Interest and attainment

Student Success in Developmental Mathematics

The cost of delayed enrollment. Delaying enrollment in developmental mathematics negatively affects student success in supplemental courses (Fike & Fike, 2012; Johnson & Kuennen, 2004; Lesik & Mitchell, 2013). Research has indicated that students who enroll in developmental mathematics during their first semester of college performed as well as their college-ready peers (Fike & Fike, 2012). Further, used as a predictor of success, those students who delay enrollment in developmental mathematics are not as likely to succeed as those students who do not (Lesik & Mitchell, 2013). This indicates the importance of developmental mathematics completion and the need to enroll as soon as possible to limit delay between the previous mathematics course and the required remediation.

Computer-aided instruction and online achievement. Many researchers have explored the use of computer-aided instruction in developmental mathematics courses and its resulting success (Spradlin & Ackerman, 2010; Taylor, 2008; Wadsworth, Husman, Duggan, & Pennington, 2007; Zhu & Polianskaia, 2007). Results indicate that students taught through traditional lecture have greater success through higher completion rates (Zhu & Polianskaia, 2007) and superior grades when compared to those students taught via computer-aided instruction (Taylor, 2008; Zhu & Polianskaia, 2007). Further, those students who are successful with computer-aided instruction shared specific characteristics including motivation, concentration, information processing, and self-testing techniques (Wadsworth et al., 2007). However, results are mixed given that Spradlin and Ackerman (2010) found no statistically significant difference between the final exam scores of students taught traditionally and those who experienced computer-aided instruction.

Gender effects were evident in research regarding computer-aided instruction and success in developmental mathematics. Although research exists indicating that significant differences do not exist between genders and their mathematics achievement (Taylor, 2008; Wadsworth et al., 2007), other research indicated differences in performance where females scored higher than males (Spradlin & Ackerman, 2010). Further, Zhu and Polianskaia (2007) found traditionally taught males had higher passing rates when compared to those taught with computer-aided instruction (61.3% to 55.6%, respectively). Female results were similar, with passing rates of 67.4% for those students traditionally taught, and 64.8% taught with computer-aided instruction (Zhu & Polianskaia, 2007).

Student attitudes can be influenced by Web-based homework in a developmental mathematics course. Research indicated that students with low to average achievement, in a course where Web-based homework is used, have a more positive attitude in comparison to higher achievers (Leong & Alexander, 2013). Benefits exist with a Web-based venue for homework in developmental mathematics courses due to the presentation of immediate feedback and the significant amount of learning opportunities provided. According to Leong & Alexander (2013), these types of variables with Web-based homework motivate lower-achieving students to learn course concepts.

Strategies for student success. Recent research regarding online supplemental resources sought to determine differences in success rates when students were required to complete online supplements (Potacco, Ramirez-Levine, Chishom, & DeYoung, 2008). Results indicated that students who complete online supplements tend to perform at higher levels and have higher passing rates than their counter parts (Potacco et al., 2008). These results demonstrated that providing students with several different content delivery methods helps to

meet diverse learning styles and provides opportunity for better understanding of course concepts.

Student attitude towards remediation, meaningful presentation of material, and content relevance are necessary in fostering developmental mathematics success. Although supplemental material helps promote success (Potacco et al., 2008), students must also believe that they can succeed and accept remediation as a path towards success through persistence (Hammerman & Goldberg, 2003). Further, instructors can foster this change by incorporating study strategies in developmental mathematics curricula (Mireles, Offer, Ward, & Dochen, 2011). Combining learning strategy instruction and supplemental instruction can improve student anxiety, attitude, concentration, motivation, and test strategies developing skills that can be used in future course work (Mireles et al., 2011).

Variables influencing success in developmental mathematics. Success in developmental mathematics is influenced by a variety of variables including: student characteristics, classroom environment, and instructor characteristics (Guy, Cornick, & Beckford, 2015; Leong & Alexander, 2014; Novac, 2016; Penny & White, 1998; Wolfle, 2012). Research results provide insight into those variables and their effect on student outcomes.

Student age and ethnicity has been shown to have influence on developmental mathematics student outcomes in college-level mathematics courses (Penny & White, 1998; Wolfle, 2012). When considered together, Wolfle (2012) found age and ethnicity to be significant predictors of success in college-level mathematics for non-traditional students. Non-traditional students (e.g., 23 or older) were 1.36 times more likely to succeed when compared to traditional students (e.g., under the age of 23). Additionally, White students were 1.29 times more likely to succeed in college-level mathematics than their non-White peers. In college

algebra, age has been found to be positively correlated with performance where students that are slightly older than typical college freshman are more likely to be successful (Penny & White, 1998).

Developmental mathematics success is influenced by a student's belief in their ability to succeed and their personal affective characteristics (Benken, Ramirez, Li, & Wetendorf, 2015; Guy et al., 2015; Novac, 2016). Students who are successful in developmental mathematics believe in their ability to succeed, regardless of their perceptions of mathematics. However, those who avoid remediation are affected by a sense of dread, discouragement, and negative perceptions of mathematics (Novac, 2016). Yet, students who succeed report positive changes in their perceived ability, enjoyment, confidence, and comfort with mathematics (Benken et al., 2015). Additionally, successful students indicate higher levels of motivation. The more successful a student is in developmental mathematics, the higher their motivation to succeed. Further, affective behaviors such as class participation, attendance, and homework completion influenced student course completion and student mathematics knowledge (Li et al., 2015). Yet, according to Guy et al. (2015) inherent value and enjoyment of mathematics have no effect on student success in terms of grades on final exams.

Preparation homework has been found to influence student's grades and self-efficacy (Mireles, Westbrook, Ward, Goodson, & Jung, 2013). Students who regularly complete preparation homework have higher grades than those who were not required to do so. Further, students indicate the use of preparation homework is important in preparing them for the next class period (Mireles et al., 2013).

Perceptions and Experiences of Developmental Mathematics Students

Research regarding student experiences in developmental mathematics and mathematics remediation has become more frequent in recent years. Using a qualitative venue, researchers have explored the following:

1) Historical disconnects in mathematics (Edwards, 2010);
2) The experiences of students who are unsuccessful in remediation and return to repeat the course (Canfield, 2013);
3) Student memories to create a critical analysis of developmental education (Duranczyk, 2007);
4) Student experiences both with a previously unsuccessful attempt and returning to a successful attempt (Howard, 2008; Howard &Whitaker, 2011;
5) The lived experiences of students attending developmental courses at a community college (Koch, Slate, & Moore, 2012);
6) Student perceptions of the placement process into developmental mathematics and developmental courses in general (Goeller, 2013; Mathai, 2014); and
7) The experiences of unsuccessful students in a developmental mathematics emporium model (Cordes, 2014).

Further, avoidance of mathematics and student perceptions of remediation has been studied amongst faculty, alumni, and students (Novac, 2016).

Perceptions of course placement. Placement in mathematics remediation is often viewed as accurate and appropriate (Canfield, 2013). Some students credit their success to accurate placement (Howard, 2008; Howard & Whitaker, 2011) and found satisfaction in said placement (Goeller, 2013). According to Cordes (2014), placement in developmental

mathematics was expected, deemed appropriate, and was believed to provide a firm foundation for college-level mathematics. This was further supported by other students who indicated that their placement changed their attitude towards mathematics, and they began to see remediation as a gateway course to future mathematics success (Mathai, 2014). However, some individuals question the need for a required mathematics course at all (Novac, 2016).

Although placement was deemed appropriate, students did not always have positive reactions (Cordes, 2014). Initially, students were negative about their placement and blamed the results on their high school education (Koch et al., 2012). Further, placement was blamed on incompetent teachers who lacked passion and care (Mathai, 2014). For these reasons, students claimed to have specific deficits leading to placement in remediation (Koch et al., 2012). Initial negativity was also blamed on placement exam completion. Some students felt that because of timing, they completed the placement exam too quickly, leading to developmental mathematics placement (Cordes, 2014). Further, placement in remediation brought feelings of discouragement and an aversion to mathematics (Novac, 2016).

Historical disconnects. Students who place into remedial mathematics often have experienced a history of disconnection with mathematics (Durcanczyk, 2007; Canfield, 2013). According to Edwards (2010), students develop this feeling of disconnect due to being overwhelmed, lacking confidence, and personal frustration with a subject manner. Further, students who claim a history of disconnect claim to have a background of poor comprehension, leading to poor attitude and lack of motivation (Howard, 2008; Howard & Whitaker, 2011). This disconnect leads students to feelings of awkwardness, embarrassment, hate, and disdain for mathematics, and a stigma that comes with mathematics remediation (Cordes, 2014).

As reported by Cordes (2014), students described a stigma that exists for students with a history of mathematical disconnect. Students believe, due to difficulty in prior mathematics classes, that they are "non-math people" portraying a fixed mindset. This mindset is supported by a history of poor performance and a belief of sub-par ability (Cordes, 2014). When students believe that they are incapable of learning material, disconnect from mathematics continues to increase.

Disconnect with mathematics develops in classes, but can be furthered by home environment. Some students claim that their family backgrounds hindered success in previous mathematical experiences (Mathai, 2014). Low parent expectations, combined with limited parental interaction, lead to a lack in educational opportunities for students. Therefore, mathematical disconnect for some students goes beyond high school education, teacher interactions, and personal belief in their abilities.

Relational teachers and classroom environment. Evidence indicates that student success is heavily influenced by mathematics instructors and classroom environment (Canfield, 2013; Cordes, 2014; Edwards, 2010; Howard, 2008; Howard & Whitaker, 2011; Novac, 2016). Teachers who care often lead students to success (Edwards, 2010), but damage to success is caused when support and care are not present (Mathai, 2014; Novac, 2016). Further, classroom environment, when positive, cultivates comfort (Koch et al., 2012), and when negative, does not. Students believe passionately that their success is heavily impacted by the teacher (Howard, 2008; Howard & Whitaker, 2011).

Student success, at all levels, is influenced by instructors (Cordes, 2014). Instructors are able to affect student success by demonstrating care for their students, patience in their interactions, and an ability to provide students with a comfortable atmosphere (Edwards, 2010;

Howard, 2008; Howard & Whitaker, 2011). When teachers provide students with encouragement, they help offset student anxiety and boost student self-efficacious beliefs (Canfield, 2013; Novac, 2016). Further, cultivating a positive environment allows students comfort in asking questions in class, via email, and during office hours (Koch et al, 2012) and in turn, promotes positive changes in math confidence (Cordes, 2014). According to Cordes (2014), positive experiences in mathematics are [also] due to a teacher's personality, enjoyment of teaching, one-on-one help, ability to build relationships, and believing in each student's ability to succeed.

Not only can teacher behavior affect student success, student behavior can also inhibit student success. Lack of success and poor attitude often points to non-caring teachers who failed to meet student needs (Mathai, 2014). Further, lack of instructor presence, like that of an emporium model, enhances lack of confidence and accountability in students (Cordes, 2014). When instructors provide poor experiences for students, an emphasis on student inadequacy becomes evident. Given that instructional methods are valuable factors to student success (Canfield, 2013), teaching style can have a negative effect on attitude and effort (Cordes, 2014).

Classroom atmosphere is also influential on student success due to peer influence and students' personal decisions. According to Edwards (2010), peers hold a significant influence on students in developmental mathematics. This influence, often negative due to comparison to others (Cordes, 2014), affects students' productivity and further enhances their historical disconnect in mathematics (Edwards, 2010). Students also described personal isolation due to anxiety with classroom environment in an emporium model (Cordes, 2014). This isolation was not purposeful; rather, it was driven by the environment.

Affective behaviors influencing success. An essential factor influencing success in developmental mathematics is motivation (Canfield, 2013; Howard, 2008; Howard & Whitaker, 2011). For many, motivation to succeed is due to family obligations and one's position as a role model for family members (Canfield, 2013; Howard, 2008; Howard & Whitaker, 2011). Because students are motivated to earn their college degree, they have a stronger level of commitment to meet that goal (Canfield, 2013; Mathai, 2014). Due to motivational factors, student affective behaviors lead them to success (Edwards, 2010).

Persistence to succeed through hard work and effort is evident in the behavior of developmental mathematics students during successful experiences (Duranczyk, 2007; Edwards, 2010). Students believe that they must put forth effort or face possible failure (Canfield, 2013). This effort is manifested in regular homework completion, which is deemed essential to course success (Canfield, 2013, Koch et al., 2013; Howard, 2008; Howard & Whitaker, 2011). Further, class engagement and curiosity is evident in extensive note taking (Howard, 2008; Howard & Whitaker, 2011) and active participation in class (Canfield, 2013). Appropriate classroom behavior, regular completion of homework, and persistent time commitment to the course (Canfield, 2013) all lead to course success.

Affective behaviors hindering student success are also evident in developmental mathematics students. Students who are unsuccessful often surround themselves with other students who are likewise struggling or have the same mathematical skill level (Mathai, 2014). Further, due to remediation stigma, students who are unsuccessful often procrastinate in terms of homework and study for exams (Cordes, 2014). Students also lack peer-support systems, given that they choose to hide their inabilities from their peers (Mathai, 2014).

Evidence that affective behaviors have a significant influence on remedial mathematics success exists. When students believe they are solely responsible for their success, affective behaviors are often put into practice. Although few students attribute their inability to succeed to laziness and lack of effort (Mathai, 2014), they still believe effort and outcomes are their responsibility (Duranczyk, 2007). Research indicates that regardless of their circumstance or history, students believe success is their responsibility (Edwards, 2010).

Alternative resources. In an effort to persist in mathematics remediation, students seek alternative resources in an attempt to understand and learn course material (Canfield, 2013; Edwards, 2010). Research indicates that available resources and support lead to course success (Koch et al., 2012). Through regular use of such campus resources as tutoring, learning centers, and math labs, remedial mathematics students are able to succeed (Howard, 2008; Howard & Whitaker, 2011; Koch et al., 2012). Resources outside of the classroom also includes online options that can be accessed at any time (Howard, 2008; Howard & Whitaker, 2011) and can be key to successful completion (Koch et al., 2012).

Failure followed by success. Often, students experience failure prior to achieving success in mathematics remediation. With initial failure, students describe a helpless orientation towards mathematics (Howard, 2008; Howard & Whitaker, 2011). Further, this helpless orientation is supported by negative feelings due to academic difficulty (Koch et al., 2012). Mathai (2014), when describing students' mathematical history in the K-12 setting, found that personal beliefs were negative due to attitude, emotions, and math self-concept. However, after experiencing failure, students are often able to gain success.

When students experience success, common factors influencing them include value in education, lessons learned, and perceived benefits. Students who succeed in remediation

experience a change in their attitude and a renewed confidence in their ability to learn (Howard, 2008; Howard & Whitaker, 2011). There is a newly found enjoyment in learning and in students' ability beliefs. Successful students perceive education as a necessity (Howard, 2008; Howard & Whitaker, 2011) providing a stepping-stone to meet long-term educational goals (Koch et al., 2012). When students are able to perform at an appropriate academic level in mathematics, they feel successful (Cordes, 2014) and are filled with increased academic confidence (Koch et al., 2012).

Research Methodologies Considered

Creswell (2013) discusses five different approaches to qualitative inquiry: Narrative research, phenomenological research, grounded theory research, ethnographic research, and case study research. Each methodology is unique in process and inquiry, and therefore, provides a backdrop from which one can answer the questions of their research. A researcher questions, what they specifically want to answer and determines what methodology to use for their inquiry. Further, one's theoretical framework for a research inquiry is influential in the methodological approach. The following discussion provides the reader with the rationale behind why a hermeneutic phenomenological study was chosen for this study and why transcendental phenomenology, along with the four other methodologies, were rejected.

Narrative research. Narrative research requires the researcher to collect stories from individuals about their lived and discussed experiences (Creswell, 2013) where the researcher is focused on telling a story that illuminates cultural and social patterns (Patton, 2015). Thus, the purpose of narrative inquiry is to tell a story about how individuals see themselves through the use of chronological ordering of their experiences based on meaning (Creswell, 2013).

Given that the purpose of narrative research is to tell individual stories—or meanings—chronologically, I rejected this methodology. Narrative research is best suited when the researcher is most interested in gathering detailed stories of a single person or a small number of people (Creswell, 2013). Therefore, narrative research does not apply in my research, given that its purpose was to describe and interpret the participants' lived experiences of success in a remedial mathematics course, not the stories of the individuals being studied.

Grounded theory research. Grounded theory inquiries seek to surpass description and discover or generate a theory (Creswell, 2013). The end result is a theory produced by data (Morse, 2009) that can help to explain an action or practice, while providing a framework for future research. According to Creswell (2013), the researcher produces a general explanation, the theory used to navigate a process, action, or interaction created through views of individuals.

With its purpose, the creation of a theory, grounded theory research seeks to develop a process created by individual views and move beyond a simple description (Creswell, 2013). Therefore, grounded theory research is not appropriate when seeking to describe the successful experiences of remedial mathematics students. Further, this research used current motivational theories that generalize why students are successful and did not seek to generate a new theory. Therefore, description and interpretation of successful experiences in remedial mathematics was the focus, rendering grounded theory research inappropriate.

Ethnographic research. Ethnographic research focuses on a specific, culture-sharing group (Creswell, 2013; Hatch, 2002; Patton, 2015). This inquiry is guided by the assumption that any human group of people will evolve into a culture if they interact together for a period of time (Patton, 2015). Typically including a large number of individuals, ethnographic research requires the inquirer to describe and interpret the shared beliefs, values, and behaviors of the

group while spending extensive time in the field. Often, the main purpose of ethnography is to advocate for the needs of a culture-sharing group to cultivate societal change (Creswell, 2013).

The use of ethnographic research was rejected because the purpose of this research did not involve the description and interpretation of the shared beliefs, values, and behaviors of a culture-sharing group. The participants in this study did not comprise a culture. Further, I sought to describe and interpret their successful experiences of successful mathematics remediation, not their shared values or beliefs. Therefore, ethnographic research was not appropriate for this study.

Case-study research. Case-study research focuses on a bounded system, the case or cases, through detailed, in-depth, data collection (Creswell, 2013; Merriam, 1988). The researcher explores a contemporary phenomenon (Yin, 2014) through single or multiple cases to describe the concern or issue (Creswell, 2013). Choosing a case, or cases, allows the researcher to examine its function and activity (Stake, 2006), focusing on uniqueness and commonalities that help provide understanding about the case (Stake, 1995).

I rejected the use of case-study inquiry because this research described the essence of a lived experience and did not focus on a unique event or an event that must be known or understood. The need to describe the essence of a successful experience in remedial mathematics does not fall within the realm of case study research. Case studies investigate an event or activity in detail (Creswell, 2013) where boundaries cannot be clearly drawn between context and the phenomenon (Yin, 2014). The phenomenon being investigated, a successful experience in mathematics remediation, was neither a specific nor bounded event. Therefore, case-study research was not an appropriate approach to inquiry.

Transcendental phenomenology. Transcendental phenomenology was rejected, given a sole focus on the description of the experience participants had with a phenomenon and less on the interpretation of the researcher (Creswell, 2013; Moustakas, 1994). Hermeneutic phenomenology requires serious interest in the inquiry (Creswell, 2013) where the researcher explores "with abiding concern" (van Manen, 1990, p. 31). Further, transcendental phenomenology requires the researcher to bracket their experiences, keeping all presuppositions in mind to limit their influence on the experience (Moustakas, 1994). This exercise was impossible for me given my experience; therefore, to understand the phenomenon, I kept my presuppositions in mind so I was able to force the knowledge against itself and expose insufficient or narrow characteristics (van Manen, 1990). Although I sought a fresh perspective, the perspective was constructed by understanding what I already believed about participants' experience with success in mathematics remediation.

Heuristic research. Heuristic inquiry requires the researcher to ponder their experience with the given phenomenon and the essential experience of others who experienced the phenomenon intensely (Patton, 2015). Although both hermeneutic phenomenology and heuristic inquiry require the researcher to have intense interest in the phenomenon, heuristic inquiry requires the participants in the study to have an equally intense interest and report on the phenomenon's personal significance to the researcher (Patton, 2015). This research did not seek to require the study participants to have the same intensive interest in the phenomenon to be explored, nor did it seek to inform its readers of the personal significance to the researcher. Therefore, the use of heuristic inquiry was rejected as method of research for this study's purposes. Research methods considered and reasons for rejection are provided in Table 3.

Table 3

Qualitative Research Methods Considered

Qualitative Approach	Data Source	Key Consideration	Reasons for Rejection	Supported by Research?
Case Study	Yin (2014) Stake (1995) Merriam (1988)	This methodology investigates a contemporary phenomenon within its real world context requiring in-depth investigation.	This research will not focus on participants within their natural setting, nor does it focus on a unique event or events	Yes
Ethnography	Creswell (2013)	This methodology studies a group that shares the same culture with the purpose of describing how it works.	This research does not seek to describe a culture-sharing group.	Yes
Grounded Theory	Creswell (2013)	This methodology finds its purpose in developing a theory grounded in data from the field.	This research does not seek to develop a theory from the data.	No
Heuristic Research	Patton (2015)	Requires participants to have an intense interest in the study.	This research does not require intense interest by participants.	No
Narrative	Creswell (2013)	This methodology analyzes data for the purposes of stories or retelling stories often of an individual's life.	This research does not focus on an individual's story and does not seek to explore the life of an individual.	N0
Transcendental Phenomenology	Creswell (2013) Moustakas (1994)	This method focuses on the description of experience and bracketing one's experience with the phenomenon.	This research describes and interprets the phenomenon without bracketing experiences.	Yes

Gaps

The high amount of students entering postsecondary institutions in need of mathematic remediation is of great concern. Further, those students who complete remediation and the subsequent mathematics course required to graduate often take longer to complete course work, spend more money, and have low levels of success (Bailey, Jeong, & Cho, 2010). Research indicates that those students in need of mathematics remediation enroll and achieve at the same level as their peers indicating that remediation failed to increase student ability (Bailey, 2009). Yet, Noble and Sawyer (2013) found that when students earn an A, they academically benefited from their developmental courses. Additionally, research in mathematics remediation indicated a need to further understand the lived experiences of the students involved (Canfield, 2013; Cordes, 2014; Howard, 2008; Koch et al., 2012; Mathai, 2014). Cordes (2014) specifically stated the lack of developmental math students' voice in literature, questioned whether developmental math students use all available resources, and questioned developmental math students' self-regulation skills. Therefore, importance was given to understanding the experiences had by students reaching a high level of academic success in mathematics remediation. A review of the literature reveals the following gaps:

1. A study was needed to examine the experiences of students who were successful in mathematics remediation where their motivation for success was explored, including their self-efficacious beliefs, to provide a better understanding of the factors leading to such beliefs.
2. Students who are successful in mathematics remediation report lower levels of anxiety, anger, and shame while experiencing high levels of enjoyment and pride. Research needed to be conducted in order to describe what it was like to be

successful in mathematics remediation and address how these feelings are developed and experienced.

3. There were no studies specifically examining the experience of participants who had a high level of success in mathematics remediation at a post-secondary institution. A study was needed to examine the lived experiences of successful remedial mathematics students and to add to the current literature and access this untapped population.

Summary

The need to understand successful experiences in mathematics remediation is evident due to the long history of remediation in higher education. Further, student motivation to be successful provides a venue from which success in mathematics remediation can be explored. Student motivation to succeed can be viewed through the theoretical lens of SCT (Bandura, 1986), AGT (Ames, 1992), and EVT (Wigfield & Eccles, 2000) focusing on course mastery and intrinsic motivation, self-worth and comparison to others, one's ability beliefs, and one's expectancy beliefs. Studies in motivation and success indicate a myriad of influences that include teaching style, gender, self-efficacious beliefs, and enjoyment. Specifically, achievement goals and expectancy-values have been found to influence academic achievement in mathematics. Literature indicates common student perceptions in mathematics remediation include those of course placement, historical disconnects, the importance of relational teachers and classroom environment, affective behaviors influencing success, seeking alternative resources, and failure followed by success. Through the use of hermeneutic phenomenology, this research seeks to add to the mathematics remediation literature addressing the lack of voice given to those students who experience success.

Chapter three discusses this study's research methodology, hermeneutic phenomenology, and the research design. Research procedures are discussed in detail, as well as data sources and data analysis. A description of the participants, the research site, and trustworthiness of the research is provided.

CHAPTER THREE: METHODS

Overview

The purpose of this hermeneutic phenomenological study was to describe and interpret how students experience success in a remedial mathematics courses. Motivation to succeed, for this study's purpose, was based in AGT (Ames, 1992) and EVT (Wigfield & Eccles, 2000) where students are motivated either by mastery or performance goals, self-efficacy, and task utility. Data collection techniques included Self-Description Questionnaire III (SDQ III) items with open response prompts; recorded focus group interviews; recorded, semi-structured, face-to-face interviews; a recorded follow-up interview; and a researcher's reflective journal. The following sections outline the: (a) design of the study; (b) the research questions; (c) the settings in which the study was conducted; (d) the participants in the study; (e) study procedures; (f) the researcher's role; (g) data collection; (h) data analysis; (i) trustworthiness; and (j) ethical considerations.

Design

A qualitative, hermeneutic, phenomenological design was used to explore the experience of success in a remedial mathematics course. Qualitative research seeks to explain the meaning of a human experience or aims at explaining the meaning of an experienced phenomenon (van Manen, 1990). Using a qualitative design was necessary to explore the successful experiences of remedial mathematics students because it requires the researcher to describe, interpret, self-reflect, and critically analyze the phenomenon in question (van Manen, 1990).

The use of phenomenology in research takes place when the researcher describes how one is oriented to a lived experience (van Manen, 1990). With phenomenological research, one must question the way individuals experience the world and seek to know how human beings

live in the world (van Manen, 1990). In this research, which sought to explore the experience of success in remedial mathematics, a phenomenological approach was ideal in determining what was most essential to a successful experience.

Hermeneutic phenomenology seeks to gain a better understanding of everyday experiences, specifically their nature or meaning (van Manen, 1990). Further, it is a reflection of an experience that has already passed or has already been lived. Processing through a hermeneutic phenomenology requires the researcher to have serious interest in the phenomenon; investigate the experience as it was lived; reflect on essential themes; describe the phenomenon by writing and rewriting; maintain a strong orientation to the phenomenon; and balance the research context by comparing parts to the whole (van Manen, 1990). Researchers who choose a phenomenological approach seek to reveal or describe the essence of the phenomenon in question (Hatch, 2002; Moustakas, 1994; van Manen, 1990). Further, hermeneutic phenomenology implies that multiple realities exist and that individual meanings given to experiences need to be studied (Hatch, 2002). Therefore, to interpret the life texts (van Manen, 1990) of the participants in this study and to describe and interpret their meanings, the use of a hermeneutic phenomenology was deemed appropriate.

Research Questions

1. What experiences influence remedial mathematics students to succeed?
2. What beliefs influence remedial mathematics students to succeed?
3. What are the factors that motivate remedial mathematics students to succeed?
4. How do successful remedial mathematics students overcome academic obstacles?

Setting

This hermeneutic phenomenological study was conducted at one small, four-year, private institution in the central US serving over 2,600 students from 37 nations and 40 states and that was accredited through the Higher Learning Commission. In 2016, 39 majors were offered by the research site for a traditional undergraduate class of 1,368 students. Of those students enrolled in 2015, 85.7% of full-time, first-time freshmen re-enrolled for fall of 2016. Traditional undergraduate students are broken down by gender where 41.5% (n = 569) are male and 58.4% (n = 799) are female. The racial breakdown by ethnicity is as follows: 1.9% (n = 26) African American, 1.7% (n = 23) Asian or Pacific Islander, 73.6% (n = 1,008) Caucasian, 6.1% (n = 84) Hispanic or Latino, 3.5% (n = 48) unknown, and 6.9% (n = 95) non-US citizen. Although a majority of traditional undergraduate students lived on campus full-time (N = 1,368), 409 students were commuters.

Students, required by mathematic placement criteria, must pass the highest level of mathematics remediation prior to advancing to college-level mathematics. The criterion for mathematics placement at this site is similar to other universities and aligns with national practices. Those freshmen who score 18 or lower on the mathematics section of the ACT, or below 480 on the SAT mathematics section, are required to enroll in Intermediate Algebra at the research site.

National mathematics placement criteria relies predominantly on national standardized exams. Those exams include the college readiness assessment exam and COMPASS Algebra and College Algebra placement tests, developed by American College Testing (ACT), and the Scholastic Assessment Test (SAT) and ACCUPLACER Elementary and College Algebra placement tests developed by College Board. Average mean cut scores indicating the need for

remediation nationally include a score of 19 on a scale of one to 36 for the ACT, a score of 471 on a scale of 200 to 800 for the SAT, a score of 70 on a scale of 20 to 120 and a score of 57 on a scale of 20 to 120 on the ACCUPLACER Elementary Algebra and the ACCUPLACER College-level tests, respectively. A score of 49 on a scale of one to 99 and a score of 43 on a scale of one to 99, require mathematics remediation, on the Compass Algebra and Compass College Algebra tests, respectively (Fields & Parsad, 2012). Table 4 provides a summary of the national mathematics placement criteria.

Table 4

National Mathematics Placement Criteria

Standardized Exam	Mean Cut Score	Standardized Exam Scales
ACT	19	1 to 36
SAT	471	200 to 800
Compass-Algebra	49	1 to 99
Compass-College Algebra	43	1 to 99
ACCUPLACER Elementary Algebra	70	20 to 120
ACCUPLACER College Algebra	57	20 to 120

Placement criteria varies given that there is no common meaning in determining whether students are academically prepared other than the dominant use of nationally standardized tests. The lack of common meaning for placement is indicated by Fields and Parsad's (2012) research. Table 5 shows that in their sample of 1,670 two- and four-year institutions, 23% used the ACT as

their mathematics placement criteria, and 17% used the SAT. In specific correlation to this research, 58% of private, four-year, not-for-profit institutions used mathematics placement tests and relied heavily on ACT (24%) and SAT (22%) scores. For these institutions, mean cut scores mirrored national practices on the ACT and SAT with scores of 19 and 459, respectively. However, given that no commonality among placement practices exists, other indicators for remediation needs included high school grade point average (GPA), high school courses completed, and faculty recommendations (Fields & Parsad, 2012).

Table 5

Institutional Placement Practices for Mathematics

Institution Type	Standardized Exam Used	Percentage of Use
Two and Four-	ACT	23%
Year Institutions[a]	SAT	17%
Private Four-Year	ACT	24%
Not-for-Profit Institutions[b]	SAT	22%

Note. [a]*N* = 1,670 two and four-year institutions sampled. [b]Represents 58% of private four-year not-for-profit institutions included in Fields and Parsad's (2012) research.

Participants

To explore how students experience success in a remedial mathematics course, participants were required to meet specific criteria. To be included in the study, each participant was required to have earned a 90% or higher in their remedial mathematics course and be currently enrolled at the research site. The study participant group needed to be homogenous (e.g., all had earned a 90% or higher on their first attempt with no prior remediation) to describe remedial mathematics success in depth (Patton, 2015). For the purposes of this study, 10 participants were included to develop a thick, rich description (Lincoln & Guba, 1985) of success

in a remedial mathematics course. The number of participants required for phenomenological research can vary, with suggestions ranging between three and four participants and as many as 30 to 60 (Creswell, 2013; Patton, 2015). However, according to Patton (2015), "the size of the sample depends on what you want to find out, why you want to find it out, how the findings will be used, and what resources (including time) you have for the study" (p. 311). Because of this, the 10 individuals chosen to participate in this study met the necessary criteria (earned a 90% at the highest level of mathematics remediation on their first attempt) and provided useful and credible information for the purpose of this research. Previous research using a similar number of participants was found to provide data saturation in a mathematics remediation course (Cordes, 2014).

Institutional Review Board (IRB) approval (Appendix A) at the research site and Liberty University was confirmed prior to contacting possible participants and collecting data. Following IRB approval at both institutions, I recruited participants using an electronically distributed student newsletter. The newsletter was communicated through the Department of Student Development at the research site and was sent out to all undergraduate students currently enrolled at the institution twice weekly. Those individuals who believed that they met the study requirements were asked to contact me via email to receive an official recruitment email (Appendix B), which included a description of the study and its purpose, the amount of time required for participation in the study, and if they wished to participate, informed consent. Further, with written permission, I asked current mathematics faculty to aid me in sending this email to past students who were possible participants so that they were receiving the email from a familiar person at the research site. Through informed consent (Appendix C), I sought permission to review student outcomes (the participants' remedial mathematics course grade)

with the research institution in order to confirm each participant met the study criteria. Through this process, I was able to obtain the desired number of participants. All participants were be offered a $10 gift card to Amazon.com or a local coffee shop of their choice, as well as the possibility of being randomly chosen as the winner of a $100 Amazon.com gift card.

The number of individuals who qualified and participated in this study was 10 ($N = 10$) where 80% were female ($n = 8$) and 20% were male ($n = 2$). Of the 10 participants, four were freshman, two were sophomores, and four were juniors. A majority of the participants were Caucasian ($n = 8$, 80%) and two were Hispanic. Most of the participants were between 18 and 21 years-old (90%), with one student whose age was between 22 and 25. All of the study participants were full-time students at the time of the study, and four of them also maintained employment. The highest level of mathematics taken prior to college by participants varied between Algebra I (30%), Algebra II (20%), Geometry (10%), Pre-Calculus (20%), and other (20%). All but two participants listed their highest level of math as having been completed during their senior year of high school.

Procedures

Prior to conducting this hermeneutic phenomenological study, IRB approval was gained through Liberty University (Appendix A) and the research site (Creswell, 2013; Hatch, 2002; Moustakas, 1994). Following IRB approval, I contacted research site administrators to recruit all current undergraduate students to participate in my study. Through the use of the research site's electronically distributed student newsletter, recruitment of students who believed they met the study's requirements were asked to contact me via email. Each student interested in participating in the study was then emailed (Appendix B) seeking their possible participation as well as those students who the mathematics department faculty believed met the criteria. The

email sent to these students included informed consent (Appendix C). After receiving informed consent, I confirmed student eligibility (they had earned a 90% or higher with no prior remediation in college) with the research institutions' registrar's office. Students who qualified to participate in the study were asked via a second email (Appendix D) to complete a demographic survey (Appendix E), the problem solving and mathematics items of the Self-Description Questionnaire III and three open response prompts (Appendix G). Those students who did not meet the study criteria were informed via email that they did not qualify to participate (Appendix G).

All participants were contacted via their research institution's email (Appendix B), the content of which (included an identification of the study, the study's objectives; the study procedures in which participants were included; foreseeable risks and benefits; how confidentiality was obtained; the persons who possible participants could contact with questions; and a statement that participation was voluntary and limited to students who are 18 years-old or older (Hatch, 2002). Initial recruitment of participants beginning in October 2016 yielded a pool of four possible participants, but only three of them qualified and participated in the study. Following this initial recruitment, an updated recruitment letter was developed with IRB approval (Appendix G). I was given IRB approval to increase incentive for qualifying participants where one of the participants would be randomly chosen to win a $100 Amazon.com gift card. Following this change to recruitment, I was able recruit three more participants by the end of October 2016. Recruitment of possible participants via the research site's electronic newsletter and via email to possible participants provided by the Mathematics department continued through December 2016 and January 2017. Recruitment of participants was complete in February 2017, given that four more individuals agreed to participant and qualified for the

study.

Students who agreed to participate in the study, believing they met the criteria, were asked to: sign informed consent (Appendix C) both electronically and physically prior to focus group interviews, complete a demographic survey (Appendix E), and complete the Self-Description Questionnaire (SDQ) III items with open response prompts (Appendix G). Informed consent was obtained from students who decided to participate via electronic submission using Google Forms™. After participants submitted informed consent, they were sent a link via email (Appendix D) to a digital survey with the purpose of collecting demographic data, SDQ III mathematics and problem solving items, and open response prompts. Demographic data was analyzed to confirm each potential participant met study criteria, particularly the need for each participant to have taken only the highest level of mathematics remediation.

To ensure the passing grade criterion (earned a 90% or higher with no previous remediation in college) and their current enrollment, confirmation was sought through contact with a research site's registrar's office. Participants who did not meet study criteria (i.e., have taken a sequence of mathematics remediation) were informed via email (Appendix G). All confirmed participants were assigned a pseudonym, which was used throughout the research process to help ensure confidentiality.

Following participant confirmation, collection of demographic data, analysis of SDQ III items and open response results, study participants were contacted to schedule focus group interviews. Students were placed in groups based on availability and convenience to conduct focus group interviews in a timely manner following initial contact with participants. Focus group interviews took place at the research site and were audio recorded and transcribed verbatim. Participants were asked to provide their signature, prior to focus group interviews, to

confirm their participation in the study and their authorization to be recorded.

After completing focus group interviews, individual, semi-structured, face-to-face interviews were scheduled with each participant taking place at the research site. Semi-structured, face-to-face interviews were also audio recorded and transcribed verbatim. Once all data had been analyzed and possible themes had been identified, the second face-to-face, follow-up interviews (i.e., interpretation through conversation) took place with each participant. The use of three data collection techniques (i.e., SDQ III items with open response prompts, focus group interviews, and individual semi-structured interviews) allowed for triangulation of data, which ensured confirmability and reliability of results and impacted each subsequent data collection technique's probing questions. All data, which included demographic information, SDQ III results, open response prompts, focus group interviews, and semi structured face-to-face interviews, was stored either digitally in a password-protected folder or as a hard copy in a locked cabinet in my (the researcher's) personal office. Figure 1 summarizes the research process.

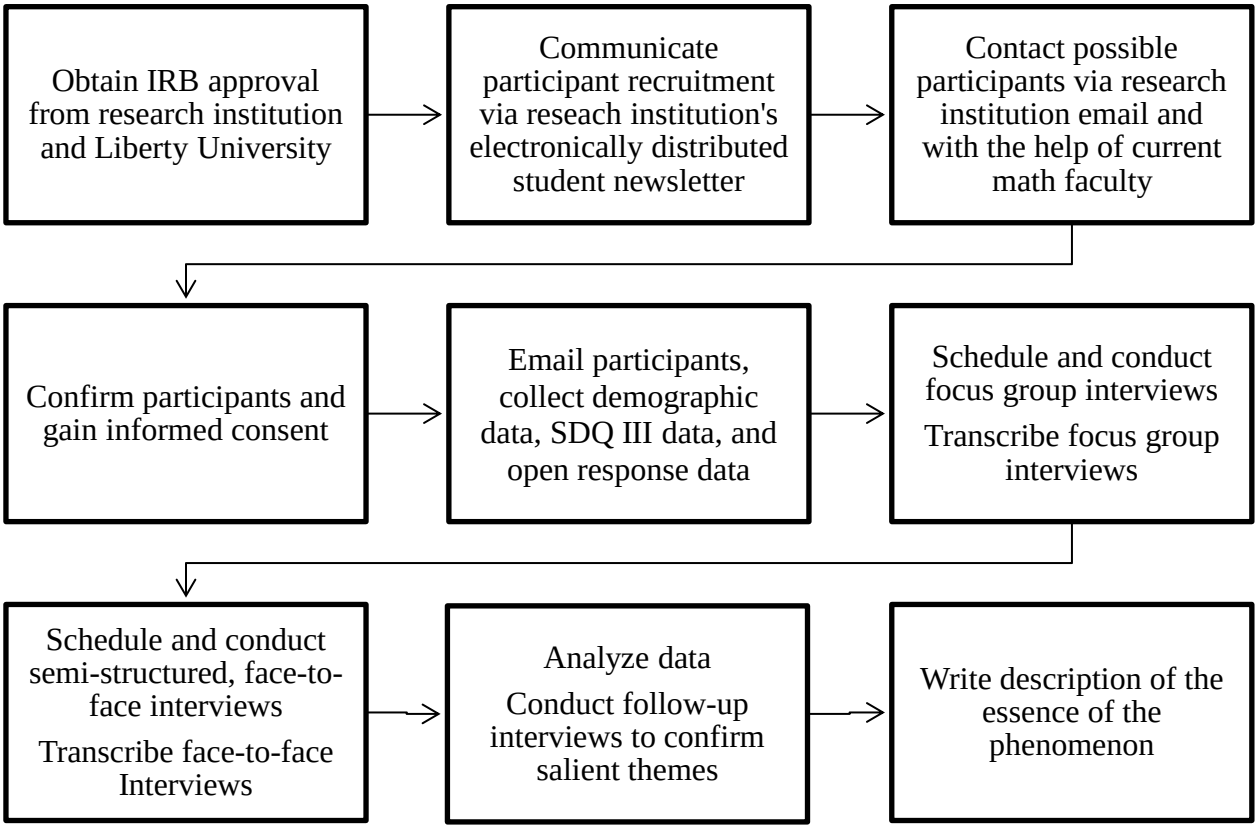

Figure 1. Research process.

The Researcher's Role

For the purposes of this study, I was the main source of data collection and interpretation as the human instrument of the study (Hatch, 2002; Lincoln & Guba, 1985; van Manen, 1990). I conducted all focus group interviews, face-to-face semi-structured interviews, and follow-up face-to-face interviews, as well as analyzed all data involved. This type of inquiry requires a human instrument to analyze context and meaning (Lincoln & Guba, 1985). Given my background with remedial mathematics, I was able to build upon my tacit knowledge through qualitative methods to describe the essence of successful completion of remedial mathematics. This was done through prolonged engagement with the participants and the data. Further, as the human instrument, I was able to respond to participant cues, adapt during the data-collection

process, process data immediately, and seek opportunities for clarification via member checks (Lincoln & Guba, 1985). All writing during this study was conducted using my perspective, with the exception of the results that were supported via participant voices and their experiences with the phenomenon.

Data Collection

The following section outlines the data collection procedures that were used in this hermeneutic phenomenological study. Data collection included a demographic survey (Appendix E), SDQ III items with research rationale (Appendix I) with open response prompts (Appendix G), audio-recorded focus group interviews (Appendix K), and audio-recorded, semi-structured, face-to-face interviews (Appendix L). Through the use of these three data collection techniques, I was able to describe and interpret the experience students have when they are successful in remedial mathematics. Table 6 provides an alignment of the study's applied theories and research questions, the data needs and sources, and the data analysis processes.

Table 6

Research Question Matrix

Theoretical Framework	Research Question	Data Needs	Data Sources	Data Analysis
Ames (1992) Bandura (1986) Wigfiled & Eccles (2000)	What experiences influence remedial mathematics students to succeed?	Past success, current success, necessity, peer comparison	Open responses, focus groups, and interviews	Holistic, selective, and detailed approaches. Reflect and compose essential themes. Writing and rewriting.
Ames (1992) Bandura (1986) Wigfield & Eccles (2000)	What beliefs influence remedial mathematics students to succeed?	Utility, value, importance, necessity means to an end, knowledge, etc.	Open responses, focus groups, and interviews	Holistic, selective, and detailed approaches. Reflect and compose essential themes. Writing and rewriting.
Ames (1992) Bandura (1986) Wigfield & Eccles (2000)	What are the factors that motivate remedial mathematics students to succeed?	Math history, goals, grades, knowledge, peers, family, experience with instructors, enjoyment, value, etc.	Open responses, focus groups, and interviews	Holistic, selective, and detailed approaches. Reflect and compose essential themes Writing and rewriting.
Ames (1992) Bandura (1986) Wigfield & Eccles (2000)	How do successful remedial mathematics students overcome academic obstacles?	Learning resources, persistence, academic support, effort, etc.	Open responses, focus groups, and interviews	Holistic, selective, and detailed approaches. Reflect and compose essential themes. Writing and rewriting.

Self-Description Questionnaire III

The Self-Description Questionnaire (SDQ) III was created to measure individual self-concept in both the academic (mathematics, reading, general academic) and non-academic (relations, parent relations) realms (Faria, 1996; Marsh & O'Neill, 1984) following the model created by Shavelson, Hubner, & Stanton (1976). Seven major features of self-concept are highlighted in the Shavelson et al. (1976) model. Those features of self-concept include: (a) organized and structured; (b) multifaceted; (c) hierarchical; (d) stable; (e) developmental; (f) evaluative; and (g) differentiability from other constructs (Marsh, Barnes, & Hocevar, 1985). Academic self-concept areas include mathematics and English, where non-academic self-concept areas include social, emotional, and physical self-concepts (Marsh, 1990). Therefore, in the Shavelson et al. (1976) model, a person's self-concept is influenced not only by their own self-perception, but also by significant others, which includes their family and peers.

According to Marsh and O'Neill (1984) questions regarding self-concept are more easily studied in older individuals and are a valuable tool for study of university students. Because of this, the SDQ III was specifically designed for measuring self-concept in late adolescents (i.e., college age students) (Faria, 1996; Maggi, 2001; Marsh et al., 1985; Marsh & O'Neill, 1984). The SDQ III is the third of three self-description questionnaires (Marsh, 1990). The first two models, the SDQ meant to measure pre-adolescents self-concept, and the SDQ II measuring self-concept in early-adolescents, were the first two SDQs developed. From the Shavelson et al. (1976) model and the SDQ came the development of the SDQ III instrument (Maggi, 2001; Marsh et al., 1985; Marsh, 1990).

A total of 13 scales, or self-concept areas, using 10 to 12 items are represented in the SDQ III (Marsh et al., 1985; Marsh, Richards, & Barnes, 1986). With the use of 136 items the

SDQ III measures self-concept in mathematics, verbal, academic, problem solving, physical abilities, physical appearance, relations with same-sex peers, relations with opposite-sex peers, relations with parents, religion/spirituality, honesty/reliability, emotional stability/security, and general self-concept (Marsh et al., 1985; Marsh & O'Neill, 1984). Each of the 136 items is measured on an 8-point scale (i.e., 1 = definitely false and 8 = definitely true) (Marsh et al., 1986; Marsh & O'Neill, 1984).

Reliability of the SDQ III has been confirmed by Marsh and O'Neill (1986) where factor correlations were low (r = .09) and reliability of the 13 factors of self-concept were found to be high (α = .89). Findings from Marsh and O'Neill's (1986) research offer strong support for the construct validity of the SDQ III and self-concept interpretations based upon the instrument. Marsh and O'Neill's (1986) findings are supported by both Faria (1996) and Maggi (2001). Faria's (1996) research findings, through the use of a Portuguese version of the SDQ III, included alpha coefficients for all 13 factors, less problem solving, that were at least .8. Specifically, mathematics and general school self-concept had reliability coefficients of .92 and .80, respectively. Maggi's (2001) research on an Italian version of the SDQ III had similar findings with mathematics self-concept (α = .88), academic self-concept (α = .85), and general self-concept (α = .92). However, unlike Faria's (1996) results, Maggi (2001) found three items to have a reliability coefficient lower than .8 (i.e., problem solving, relationships with same-sex peers, honesty and reliability). In both studies, the SDQ III instrument was found to be reliable as a self-concept rating scale (Faria, 1996; Maggi, 2001). The SDQ III has been determined to be the best and most valid instrument for self-concept measurement of adults (Byrne, 1996).

In this study, I used the SDQ III to help measure self-efficacious beliefs in mathematics using two factors from the instrument, mathematics and problem solving (Appendix I). These

factors of the SDQ III helped in explaining past and current self-efficacious beliefs the participants had regarding their mathematical ability and motivation to succeed. Bandura's (1986) SCT states that individuals are not only motivated by intrinsic and extrinsic factors, but also by environmental factors. Further, EVT indicates that a person's motivation to complete a task is influenced by their self-efficacious beliefs and expectation for future outcomes (Wigfield & Eccles, 2000), as well as helping to determine participants' goal orientation (Ames, 1992). Because of this, using the items related to mathematics and problem solving provided me with meaningful data describing how participants view their mathematical abilities and its relation to their remedial mathematics success. Appendix I provides each SDQ III item that was used, the rationale for each item, prior research, the research question that it will help answer, and the theory supporting each item.

The SDQ III instrument was made available in public domain by the Institute for Positive Psychology & Education (IPPE) (https://ippe.acu.edu.au) at Australian Catholic University. Permission to use the document in my study was based on a set of terms and conditions that can be found in Appendix L. IPPE holds the right with my use of the instrument to negotiate access to my data based on the instrument seeking some demographic information and location of administration and required users to meet individual instrument usage conditions. Therefore, use of the Self-Description Questionnaire III was granted from the SELF Centre, given collected data was made available in electronic form to the SELF Research Centre. Specific requirements for usage of the SDQ III can be found in the notes section of Appendix I.

Open Response Prompts

According to van Manen (1990), one of the more natural ways to gain information regarding a phenomenon is to ask individuals to write down what they have experienced.

Participants were asked to engage in what is referred to as "protocol writing," where they generated original texts about the experienced phenomenon (van Manen, 1990). Using van Manen's (1990) suggestions for protocol writing, participants were asked to describe their successful experience by describing how they lived through the experience and how they felt during it. They were also asked to describe specific events or examples during the experience, focusing on an example that stood out, with the goal of having direct accounts of the participants' lived experience. Participant responses were anticipated to vary in length, but were not expected to be excessive. Open response prompts, correlating research questions, the theories supporting the questions, and research in support of the questions can be found in Appendix M.

Open response results were analyzed through the use of van Manen's (1990) systematic processes of holistic, selective, and line-by-line approaches. Initially, prior to audio-recorded, focus group interviews, open response results were read and reread to get a holistic understanding of the phenomenon of successful completion of a remedial mathematics course. Thematic impressions were recorded in my researcher's journal as I reflected on the overall meaning of data provided in the responses. Thematic impressions gleaned from the responses were used to inform audio-recorded, focus group interviews. The selective and line-by-line approaches described by van Manen (1990) were employed after both audio-recorded, focus group interviews and audio-recorded, semi-structured, face-to-face interviews were completed and transcribed verbatim.

Focus Groups

Focus group interviews were conducted in this study with the purpose of facilitating consensus regarding participants' experience. According to Patton (2015), interviewing

individuals in groups provides a social experience for the participants. When individuals interact with each other, they gain a better understanding of their own views. This interaction allows the participants to gauge their own understanding and feelings, as well as help make sense of their behavior (Patton, 2015). Because of this, focus group interviews helped to develop a deeper understanding of the lived experience (Moustakas, 1994) that participants had with successfully completing remedial mathematics.

I used groups consisting of three to five participants and I scheduled focus group interviews based on convenience and availability. Although Patton (2015) suggests focus groups consist of six to ten people, given the desired number of participants for this study was 10 to 15, and because of availability, I used four focus groups: two groups of three and two groups of two. According to Morgan (1997) groups of three to five is acceptable for the phenomenon being investigated. Focus group question one referred to previous student experiences that may have shaped their motivation to succeed or influenced their goal orientation. Previous research has indicated that student attitude and motivation is often affected in a positive manner by turning points of success (Cordes, 2014; Howard, 2008; Howard & Whitaker, 2011). Further, AGT indicates an individual's motivation is affected by achievement goals on a given task (Ames, 1992). Previous experiences influence student purpose (Bandura, 1986) and expectancy for success (Wigfield & Eccles, 2000), in this case goal orientation, providing insight into why students were motivated or able to achieve at such a high level.

AGT (Ames, 1992) and EVT (Wigfield & Eccles, 2000) indicate four areas that provide motivation for student success. Focus group questions two through five provided a framework for student perceptions regarding these areas of motivational theory. Specifically, questions two and three answered whether highly successful students are mastery goal oriented or performance

goal oriented (Ames, 1992). Question four helped explain how student self-efficacy can influence highly successful students' motivation (Wigfield & Eccles, 2000), and question five helped to explain the importance of the course through the eyes of the successful student. Utility of the course, or its overall importance to the student, was sought through this question. In this way, question five was framed within the task utility subset of EVT. All six focus group questions were supported by previous research (Canfield, 2013; Cordes, 2014; Howard & Whitaker, 2011). Focus group questions can be found in Appendix K, and Appendix N provides each focus group question, rationale for the question, prior research, the research question to be answered, and the supporting theories.

The use of focus group interviews allowed me, the researcher, to follow up on the information gleaned from overall themes of the open response question results. Using focus groups, in series, was an effective strategy for exploring topics from different participant perspectives (Hatch, 2002). I was able to refine focus group questions by focusing on the dominant themes gleaned from the open response question results. Further, the focus group interviews helped to reshape the face-to-face, semi-structured interviews, pointing them more towards dominant themes (Hatch, 2002). All focus group interviews were audio recorded and transcribed verbatim for analysis.

Interviews

The third data collection technique that I used was audio-recorded, semi-structured, face-to-face interviews with standardized, open-ended questions. Interviews utilizing open-ended comments and questions are the most typical form of data collection for a phenomenological investigation (Moustakas, 1994). Hatch (2002) refers to semi-structured, face-to-face interviews as formal interviews where the researcher takes the lead by guiding the process. Using this

format requires the researcher to be prepared for interviews with guiding questions that are open ended to follow the participants' leads, which in turn, allows for probing questions during the interaction (Hatch, 2002). Participants were contacted following focus group interviews to schedule a time and date for the face-to-face interviews

Face-to-face, semi-structured interviews took place at the research site with each individual participant. Locations for the interviews were in known academic buildings on campus. The use of interview protocol (Appendix L) guided each interview (Creswell, 2013; Hatch, 2002; Moustakas, 1994), allowing for focused questioning that ensured each interview had the same lines of inquiry and serving as a checklist for all relevant topics to be covered (Patton, 2015). Further, interview questions were developed based on this study's theoretical framework, in addition to van Manen's (1990) hermeneutic phenomenological processes that emphasize what an experience is really like. Hatch's (2002) essential question framework, which includes open-ended descriptive, structural, contrast questions, and Moustakas (1994) general interview guide suggestions using broad questions to help facilitate robust responses from the participants, were incorporated. Each interview was audio recorded, transcribed verbatim, and analyzed. The standardized, open-ended interview questions, the research question they helped answer, prior research, and theories supporting the questions can be found it Appendix O.

Follow-Up, Face-To-Face Interviews

Follow-up, face-to-face interviews were conducted to determine the most salient themes gleaned from the open response prompts, focus group interviews, and initial, face-to-face, semi-structured interviews. These audio-recorded, follow-up interviews were what van Manen (1990) called "interpretation through conversation" (p. 97). Each participant was asked to meet one

final time to discuss identified themes from collected data in collaboration with myself, the researcher. In collaboration, I, the researcher, and interviewee determined the significance of the identified preliminary themes. The goal of these conversations was to produce themes and insights from which I, as the researcher, was able to create a text (van Manen, 1990).

Data Analysis

In discussing data analysis, van Manen (1990) states that the "essence of a phenomenon is never simple or one-dimensional" (p. 78). Therefore, to analyze the data, the researcher must reflect extensively on the data describing the participants' lived experience. Additionally, the researcher must reflectively analyze the "structural and thematic aspects of that experience" (van Manen, 1990, p. 78). The following outlines the processes used to analyze the lived experience of successful completion of a remedial mathematics course. All data were considered as parts to the whole (van Manen, 1990) when isolating thematic aspects first through the: (a) holistic approach, then through the (b) selective approach, next through (c) line-by-line approach, (d) composing linguistic transformations, (e) determining incidental and essential themes through imaginative variation, and (f) writing and rewriting to describe the essence of the phenomenon.

Holistic, Selective, and Line-by-Line Approaches to Analysis

Holistic approach. The holistic approach requires the researcher to consider the entire text as a whole (Hatch, 2002; van Manen, 1990). The purpose is to find a single statement to describe the meaning of the text, or main significance of the text, as a whole. Then the goal of the researcher is to determine or formulate such a phrase (van Manen, 1990). To arrive at such a statement, the researcher must balance, or consider, the parts to the whole (van Manen, 1990). But before one can look specifically at the individual parts of the data collected, one must first see texts holistically (Hatch, 2002).

For the purposes of the holistic step, open response results were read and reread to immerse in the data, and a phrase describing the meaning of those texts was formulated. Following the focus group interviews, transcripts were then read and reread, and audio recordings were listened to several times to immerse myself (as the researcher) in the data collected. Following this process, a phrase was formulated that described the meaning of the focus group interview data. Finally, after the face-to-face, semi-structured interviews with each participant were conducted, transcripts was read and reread and audio recordings were listened to several times, again to immerse myself (as the researcher) in the data collected. From the data collected via face-to-face, semi-structured interviews, a phrase was formulated that described the meaning of the interviews as a whole.

Selective approach. During the selective reading approach, the researcher reads the text several times, or listens several times, asking themselves what statements or phrases seem essential or most revealing about the phenomenon being studied (van Manen, 1990). As the text is read and reread, listened to and re-listened to, the researcher makes note of these phrases and statements by circling, underlining, or highlighting the statements in the text. This stage in the data analysis is most closely related to horizontalization described by Moustakas (1994) in the transcendental phenomenological approach, where the researcher lists every expression relevant to the phenomenon being studied, known as codes.

Following the completion of each stage of data collection, and the completion of the holistic phase of data analysis, I read each text individually several times and sought phrases that were most revealing about the experience students have when successful in remedial mathematics (Moustakas, 1994). Further, I listened to the audio recordings of both the focus group interviews and the face-to-face, semi-structured interviews while following along with the

transcripts to determine, between the two identical sources, each significant statement that was most essential to the essence of remedial mathematics success. This process provided me with data immersion so that I could be as close to the participants' experience with the phenomenon as possible.

Line-by-line approach. When using the line-by-line reading approach, the researcher analyzes each sentence or sentence cluster (van Manen, 1990). The researcher must move through the text line-by-line and ask what insight each sentence or sentence cluster provides about the phenomenon being studied. This process must be done carefully, with attention given to each sentence or sentence clusters separately to reveal their meaning in regards to the phenomenon (van Manen, 1990).

To conduct the line-by-line process, each open response result, focus group interview, and face-to-face, semi-structured interview was read and reread and then systematically reviewed line-by-line. Each line of the different data types was analyzed to determine what was revealed about experiencing success in a remedial mathematics course.

Researcher's reflective journal. According to Hatch (2002), journal entries including initial impressions of the phenomenon should be taken during data collection and then reviewed. By reviewing these initial impressions, the researcher begins to make relational connections between themes and likely will develop new impressions (Hatch, 2002).

I used a reflective journal (Appendix P) to record notes during data collection and analysis (i.e., holistic, selective, and line-by-line approaches) to help in development of themes prior to composing linguistic transformations. The examination of my research journal entries taken during data analysis further illuminated those themes most essential to experiencing success in a remedial mathematics course.

Development of Themes. To develop phenomenological themes, the researcher must seek to reveal something meaningful and telling from the varied experiential accounts found in the data (van Manen, 1990). According to van Manen (1990), the researcher must examine the texts and bring examples of the experience into a reflective understanding. One must seek something meaningful and glean it from the data. Further, by asking what is taking place or what type of example to do I have, the researcher can begin to develop thematic formulations (van Manen, 1990). Thematic meaning was first identified in each participant's open response results, focus group interview, and face-to-face interview by developing a theme that fundamentally expressed the overall meaning of each text as it pertained to the phenomenon through van Manen's (1990) holistic approach. Through the use of selective reading, thematic elements were determined by reading and listening to each text several times. Finally, each data source was read line-by-line, by sentence or sentence cluster, and then meaning behind the sentence or sentence cluster as it relates to the studied phenomenon was developed. In accordance with van Manen (1990), an initial description of the phenomenon was made by composing linguistic transformations.

When analyzing results of the open response prompts, the focus group interviews, and the semi-structured, face-to-face interviews, I developed open codes for the purpose of theme development. Initial codes were identified during analysis of the participant responses the open response prompts provided. Approaching the open response prompt results holistically, line-by-line, and selectively revealed open codes and provided initial insight into a successful remedial mathematics experience. These open codes also provided background from which I was able to probe participants more directly during focus group interviews.

Analysis of the focus group interviews holistically, line-by-line, and selectively revealed further evidence of the initial codes discovered during open response prompt analysis, in addition to new open codes developed from the focus group data. Whereas some initial codes were more evident during open response prompts, others became even more evident during the focus group interviews. Further, other open codes were only evident during the focus groups and did not appear in participant response to the open response prompts.

Semi-structured, face-to-face interviews were analyzed identically to the open response prompts and focus group interviews in holistic, line-by-line, and selective approaches. Results of both the open response prompts and focus group interviews, and the open codes discovered, informed me of the themes developing from the data. Using these prior open codes, I was able to further develop the illuminated themes via probing questions. Not all prior open codes were found in the semi-structured, face-to-face interview data provided by participants. However, the most prominent themes found during analysis developed from open codes were discovered to exist across all three data points.

Composing Linguistic Transformations

Van Manen (1990) suggests that researchers capture thematic statements in phenomenological written paragraphs, which should be developed from the meaning clusters revealed during the horizontalization process. From the meaning clusters, or theme-based words and statements found in the data, a description of the phenomenon develops. Therefore, through the use of researcher reflective notes (in paragraph form) and based on the data readings and other research activities (Hatch, 2002), a description of what experiencing success in mathematics remediation is like was developed. Therefore, the process of composing linguistic transformations was the creative aspect of my hermeneutic analysis (van Manen, 1990).

I composed linguistic transformations to capture salient thematic statements. This process allowed me to begin organizing and reflecting on those themes that were most pertinent to the studied phenomenon: those that most constituted the nature of the lived experience of success in a remedial mathematics course. Further, this process of reflection allowed me to find those themes that were salient to the description of the lived experience (Moustakas, 1994; van Manen, 1990). Following the development of linguistic transformations and leading to the development of a description of mathematics remediation success, I met with each participant again to discuss the themes identified. These audio-recorded, follow-up interviews with each participant discussed the significance of the initial themes found during the development of linguistic transformations.

Interpretation Through Conversation

During the follow-up interviews, reflection on the developed phenomenological themes was discussed. According to van Manen (1990), during interpretation through conversation, both the interviewer and interviewee seek to interpret the significance of the initial themes found in the data. Through interpretive conversation, both the researcher and participant ask, “Is this what the experience is really like?” (van Manen, 1990, p. 99).

Through the use of interpretive conversation, I was able to determine those themes deemed most salient to the experience of a successful experience in remedial mathematics. Further, these conversations helped in the development of linguistic transformations, leading to a clarification of the essence, or structure of meaning, behind a successful experience in remedial mathematics.

Imaginative Variation

Prior to the phenomenological description of the phenomenon's essence, the researcher must determine those themes around which the description will be placed (van Manen, 1990). Each meaning encountered is not essential or unique to experiencing success in remedial mathematics. Therefore, the researcher must use the method of free imaginative variation—the process for determining what themes are essential to the phenomenon—to begin creating the textural descriptions found in the linguistic transformations (van Manen, 1990). This is done by asking, "Is this phenomenon still the same if we imaginatively change or delete this theme from the phenomenon?" and "Does the phenomenon without this theme lose its fundamental meaning?" (van Manen, 1990, p. 107). This process allows the researcher to focus on the essential themes—those aspects that make the phenomenon what it is—rather than those themes that occur by chance. Imaginative variation requires the researcher to seek possible meanings by varying their frames of reference and taking different positions towards the experienced phenomenon. This allows the researcher to discover underlying factors that account for what participants experienced. Hatch (2002) says that the researcher must determine what themes are essential based on evidence within the data that directly addresses each one.

Description of the Essence

Writing and rewriting. According to van Manen (1990), the analysis process does not end when the researcher starts writing. The researcher's purpose is the creation of the phenomenological text (van Manen, 1990), but the researcher must be mindful of the final texts' purpose. Therefore, the researcher is always aware of the research questions and their writing must always be meant to answer those questions being asked. Writing allows the researcher to reflect on what is known about the phenomenon and describe the lived experience (Hatch, 2002).

Writing is a phenomenological researcher's method (van Manen, 1990) and one must write to make some area of lived experience understandable (Hatch, 2002).

By writing, we are able to measure what we do and do not know about the phenomenon being studied (Hatch, 2002). When we write, we are separated from what we know, but also become closer to those things that we do know. Further, writing focuses the researcher's reflective awareness, allowing the disregard of incidentals and contingencies that compose the social, physical, and biographical context of a specific scenario (van Manen, 1990). As one reflects through writing, the process allows engagement in more reflection, increasing the ability to see the essence of the phenomenon under study.

Van Manen (1990) says that one must write and rewrite to capture the true essence of a studied phenomenon. This allows the researcher to rethink, reflect, and recognize the importance and substance of essential themes (Hatch, 2002). To create a text with depth, the researcher must write and rewrite, moving back and forth between the individual parts and the data as a whole to create a well-developed manuscript (van Manen, 1990). One must bring their recollection to text via edits, revisions, and rewrites of that which is significant to the studied phenomenon.

Anecdotal narrative. The process of writing and rewriting, a necessity in coming to the final product of hermeneutic phenomenological study, took place following the determination of essential themes. Through the use of anecdotal narrative, the essence of experiencing success in remedial mathematics was described. According to van Manen (1990), anecdotes help uncover meanings force us to search out the relationships between living and thinking, provide us with insight into unwritten teachings, provide insight and truth, and help us see things in a specific way. Therefore, anecdotes constituting the nature of the essence (composed of several examples) are provided in describing the experience of success in a remedial mathematics

course. Figure 2 outlines the research analysis process culminating in a description of the essence of the successful remedial mathematics experience.

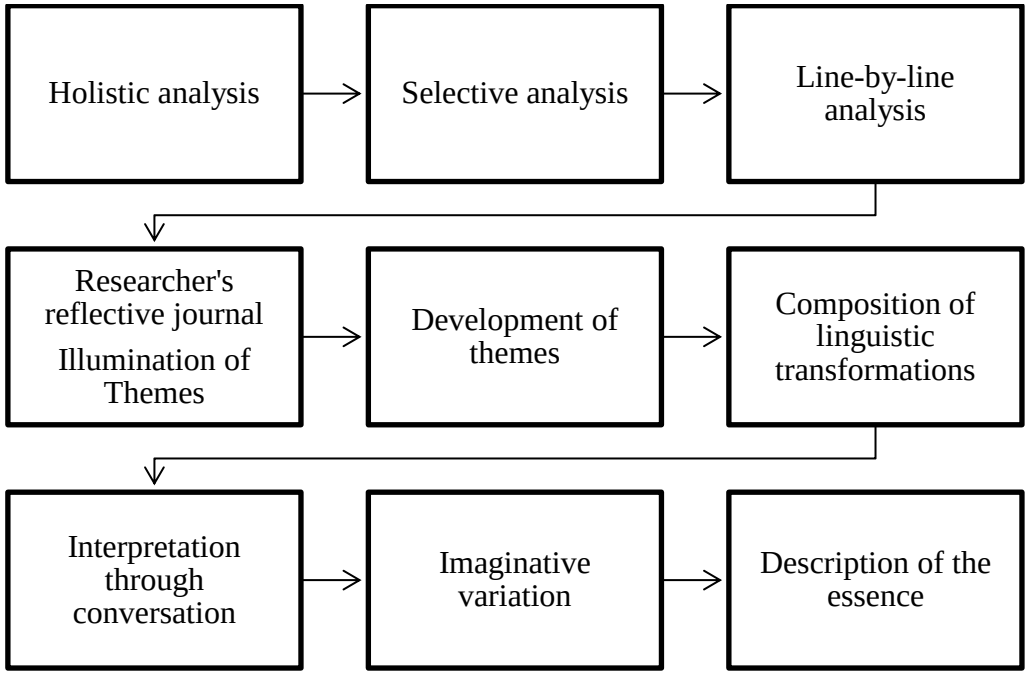

Figure 2. Research analysis process.

Trustworthiness

This section describes the aspects of this research that provide trustworthiness for the reader regarding the developed description of the experiential essence of remedial mathematics success. Lincoln and Guba (1985) describe trustworthiness in one's confidence in the factuality of the findings, how applicable the findings are, consistency of the findings, and neutrality of the findings. Steps to ensure trustworthiness include credibility, dependability, transferability, and confirmability. Trustworthiness of the data collection techniques, as well as reporting based on collected data, is reviewed. Further, the necessary ethical considerations for the study, as well as several limitations, are referenced. Support for study credibility, via member checks and data

triangulation, is discussed in addition to the dependability, transferability, and confirmability of the results.

Credibility

Lincoln and Guba (1985) describe credibility as a provided assurance that the researcher's representation of the participants' views is the same as the actual views of the participants. Credibility will be confirmed through member checking to verify data found in the transcriptions, findings, and researcher interpretations (Creswell, 2013). For the purposes of this study, I used what van Manen (1990) calls "interpretation through conversation" (p. 97). Each participant in the study was asked to meet with me a third time to discuss transcript themes that I identified. This was done to determine whether the themes identified were appropriate in describing what success in a remedial mathematics course is like. Input from these conversations was used in the creation of the final textural description of the phenomenon. After completion of the textural description of the phenomenon, each participant was asked to read the developed description, react to the interpretation (Hatch, 2002), and confirm its accuracy (Lincoln & Guba, 1985).

Credibility was further established through triangulation of data. Hatch (2002) describes triangulation of data as confirmation of information obtained from another source or informant where data comparisons take place. The use of triangulation provides corroborating evidence and insight on the perspective provided through analysis (Creswell, 2013) and provides great power to the phenomenon under investigation (Hatch, 2002). The use of multiple and different sources of evidence (Lincoln & Guba, 1985): a participant's open response, focus group interviews, face-to-face semi-structured interviews, and follow-up interviews provided corroborating evidence for the essential themes describing the phenomenon contributed to

confidence in the reported findings (Hatch, 2002). Further, prolonged engagement with the participants (Lincoln & Guba, 1985) and the data—through dedication to reading and rereading, writing and rewriting—allowed me to make informed decisions regarding the description and interpretation of the themes deemed essential to the phenomenon's essence (van Manen, 1990). Further, the use of a reflexive journal, which I used regularly, provided schedule details and a venue for my reflection (Lincoln & Guba, 1985).

Dependability and Confirmability

According to Lincoln and Guba (1985), dependability focuses on the process of inquiry and requires the researcher to ensure a logical, traceable, and documented process. To provide this type of detail, a thorough description of the data-collection procedures are provided. I kept a detailed record of the data collection and process to create an audit trail. A thorough examination of procedures and results was conducted throughout the research by both the dissertation committee and my research consultant. Dependability was also established through the use of the reflexive journal, as referenced above.

Confirmability refers to the objectivity of the researcher and their ability to provide interpretations linked to and grounded in the data (Lincoln & Guba, 1985; Schwandt, 2007). To confirm results, evidence found in study data was used to support the phenomenon's essential themes. The essential themes were determined via multiple forms of data and the researcher's data immersion during the analysis phase of the study. Further, member checks via conversational interviews were conducted to ensure accuracy of findings prior to development of the textural description of the phenomenon's essence. With data support, data triangulation, data immersion, and member checks, results of the study were confirmed.

Transferability

Transferability, a researcher's responsibility to provide sufficient information on a study, allowing a reader to establish similarities so that findings might be transferred to other studies (Schwandt, 2007), is a main responsibility of the qualitative researcher. To create transferability, one must provide the reader with rich, thick descriptions of the experience (Lincoln & Guba, 1985). Through holistic, selective, and line-by-line analysis (and after having immersed myself in the data via listening and re-listening to audio recordings, reading and rereading transcripts of interviews and focus group interviews, and writing and rewriting of essential themes), I was able to provide the reader with rich, thick descriptions of the essential themes occurring during a one's experience with success in remedial mathematics. Descriptions are underpinned with personal reflection, growing insights, and development of essential themes accounted for in my reflexive journal (Lincoln & Guba, 1985).

Ethical Considerations

As is necessary in any research project, ethical considerations were accounted for by me, the researcher. The first step in this process was IRB approval, which was obtained prior to all aspects of research pertaining to the research site and all participants. To provide complete anonymity throughout the study, each participant was provided with a pseudonym with which they were referred to in all interviews, focus groups, and open responses. Further, the research site was described, but provided anonymity with the used of an assigned pseudonym. All necessary parties were provided with adequate information about the study, its purpose, and the extent of the research (e.g., amount of time on site, time needed to complete data collection).

Data from semi-structured, face-to-face interviews, focus group interviews, follow-up interviews, and open responses were saved on a personal computer or external hard drive in a

password-protected folder. All hard copies of research documents were held in a locked cabinet in the researcher's office and will be destroyed after three years. Further, given that grade confirmation was required, student records were held in complete confidentiality with only their remedial mathematics course grade being sought.

Summary

The purpose of this hermeneutic phenomenological study was to describe and interpret the essence of experiencing success in remedial mathematics course. Through the use of SDQ III items, open response prompts, focus group interviews, semi-structured face-to-face interviews, and follow-up interviews, a naturalistic generalization of the experience provided a rich, thick description of the phenomenon's essence (Lincoln & Guba, 1985). Trustworthiness of the analysis was provided by establishing credibility, dependability, transferability, and confirmability. Typical ethical considerations were considered, as well as additional ethical issues that I, the researcher, became aware of during the research process. Chapter Four provides the results of data analysis, including essential themes, and a description of the essence of the phenomenon. Further, an individual participant overview is provided.

CHAPTER FOUR: FINDINGS

Overview

The following chapter describes themes derived from the analysis of participants' answers to the Self-Description Questionnaire III (SDQ III) mathematics and problem solving items, answers to open response prompts, focus group responses, and semi-structured, face-to-face interviews. A description of the individual participants is provided texturally. Additionally, the essence of the experience that successful remedial mathematics students had is provided based on the discovered themes. Themes that emerged during analysis are listed based on the individual research questions that they address. Emerging themes, separated by the research question they address, include:

- previous math outcomes, quality of the instructor prior to remediation, and an emphasis on academics by influential people;
- belief in the value of remediation and belief in the importance of higher education;
- sense of community, change in attitude, and motivation due to mastery and performance; and
- quality instructor, exhaustion of available resources, and personal persistence.

Participants

A total of 10 students participated in this study. Of those students participating, eight were female and two were male. A majority of the participants had previously completed a mathematics course as a high school senior (60%) in content areas that included Algebra I, Algebra II, Geometry, and Pre-Calculus. Participants' academic focuses ranged from photography to nursing, and for two participants listed English as their second language. Participants self-reported their academic classification, and the distribution was: four juniors,

two sophomores, and four freshmen. The following section provides a description of the participating individuals, whose names have been changed to pseudonyms to maintain confidentiality. The demographic survey can be found in Appendix E.

Andrew

Andrew, a junior in college, was a Hispanic male, approximately 18-21 years of age, majoring in digital cinema as a full-time student. Andrew's highest level of mathematics prior to college was Algebra I, taken as a senior in high school. Andrew's native language is Spanish. When discussing his chosen major of digital cinema, Andrew said, "I want to create content and share more of the way that I see the world . . . Because of this curious mind I have, I just want to share more of it… it feels very important to talk about things not many people come up with."

Bethany

Bethany, a junior in college, was a Caucasian female, approximately 18-21 years of age, majoring in Nursing as a full-time student. Bethany's highest level of mathematics prior to college was Pre-Calculus, taken as a senior in high school. Bethany discussed what influenced her to major in nursing by saying, "I've always wanted to do something in the medical field." She continued, when referring to visits to the hospital with her mom, by saying, "When you're there, you see nurses who are genuine and care about their job, and they care about talking and making sure the people who are there are comfortable."

Colene

Colene, a junior in college, was a Caucasian female, approximately 18-21 years of age, majoring in English as a full-time student. Colene's highest level of mathematics prior to college was senior mathematics, taken in high school. When asked why she chose to major in English

and creative writing, Colene responded, “I’ve always like to read and write . . . I’ve just always liked to read and everything and write about it.”

Donna

Donna, a junior in college, was a Caucasian female, approximately 18-21 years of age, majoring in Family and Human Services as a full-time student. Donna’s highest level of mathematics prior to college was Geometry, taken as a senior in high school. When asked about her chosen major Donna said, “My major is family and human services. I’ve always been really passionate about helping people, and so I’m wanting to do social work or work with DHS.” Further, she said, “It’s always tugged at my heart to work with people that are struggling and need that kind of help.”

Evie

Evie, a freshman in college, was a Caucasian female, approximately 18-21 years of age, majoring in Nursing as a full-time student. Evie’s highest level of mathematics prior to college was Algebra I, taken as a junior in high school. During Evie’s semi-structured, face-to-face interview, she discussed growing up in Russia. Evie said, “I moved to Russia when I was about eight-years old; that’s really when I started growing in a lot of ways. And so I really felt like Russia was my home. I felt like it was my first language and culture.”

Farah

Farah, a sophomore in college, was a Hispanic female, approximately 22-25 years of age, majoring in International Business as a full-time student. Farah’s highest level of mathematics prior to college was listed as “other,” taken as a sophomore in high school. Farah’s native language is Spanish. When Farah was asked why she chose her major, she said, “I want to get

involved in finance." She continued, "I think we need to learn more about what is happening outside of our world . . . [and] my biggest dream is be part of World Vision."

Gretchen

Gretchen, a college freshman, was a Caucasian female, approximately 18-21 years of age, majoring in Elementary Education as a full-time student. Gretchen's highest level of mathematics prior to college was Pre-Calculus, taken as high school senior. When asked why she chose the research site for college, Gretchen said, "I wanted to grow in my faith, and I wanted to play volleyball."

Heather

Heather, a freshman in college, was a Caucasian female, approximately 18-21 years of age, majoring in Elementary Education as a full-time student. Heather's highest level of mathematics prior to college was Algebra II, taken as a senior in high school. When asked why she chose nursing as a major Heather said, "I just always really wanted to help people . . . 'cause I just love helping."

Jason

Jason, a college freshman, is a Caucasian male, approximately 18-21 years of age, majoring in Graphic Design as a full-time student. Jason's highest level of mathematics prior to college was Algebra I, taken as a senior in high school. When asked about his family, Jason described an interesting aspect of his childhood. Jason said, "We were originally going to try and live off the land out in the . . . kind of in the sticks. Out in the middle of nowhere —no electricity, all that." When asked how long his family had this lifestyle Jason said, "We did that pretty close to a year."

Kelly

Kelly, a sophomore in college, is a Caucasian female, approximately 18-21 years of age, majoring in Nursing as a full-time student. Kelly's highest level of mathematics prior to college was Algebra I, taken as a senior in high school. When asked why she chose to major in nursing Kelly said, "I chose it because, it's a long story . . . basically I didn't want to be a nurse, and then God got ahold of me and said, 'This is what you're doing.'"

Results

The following sections discuss the results of this study's data analysis. Self-description Questionnaire III results are explained through their support of discovered themes. Themes explaining the lived experience of successful remedial mathematics students are organized by this study's research questions and provided. Additionally, a description of the essence of experiencing success in mathematics remediation is given below.

Self-Description Questionnaire III Results

Participants were asked to complete the mathematics and problem solving items of the SDQ III (Appendix I) measuring their self-efficacious beliefs. Each of the items listed on the SDQ III is measured on an 8-point scale. Figure 3 provides the possible responses to each item and their corresponding numerical value. Appendix Q provides each participant's numerical response and the average response for each item is given as a general representation of how members of the participant pool described themselves. My interpretations of the SDQ III results and their support of the themes derived during data analysis are discussed in the themes section below.

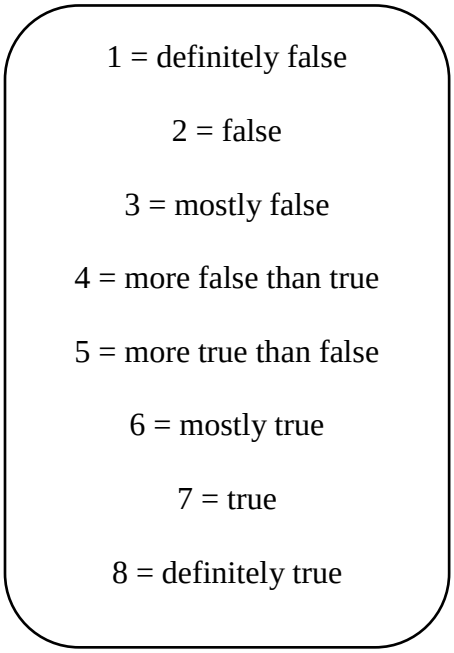

Figure 3. Self-Description Questionnaire III response options with corresponding numerical values.

Themes

The following section provides a variety of themes found in the participant data related to the research questions that I sought to answer. Data collection techniques used to answer each research question included open response prompts (Appendix F), focus group interviews (Appendix J), and semi-structured, face-to-face interviews (Appendix K). Answers to this study's research questions are provided via participant response. Open codes used during analysis of each data collection technique are provided in Appendix R. The number of times each code appeared across each individual data collection technique and themes determined based on these codes is provided.

This study's research questions were:

1. What experiences influence remedial mathematics students' success?
2. What beliefs influence remedial mathematics students to succeed?

3. What are the factors that motivate remedial mathematics students to succeed?
4. How do successful remedial mathematics students overcome academic obstacles?

Data triangulation. Each data set was analyzed using van Mannen's (1990) holistic, line-by-line, and selective approaches. Open codes were determined in each data set throughout the provided texts. Open response prompts produced a limited number of codes based on the prompts given to participants. In some cases, codes used in analysis of both the focus group interviews and semi-structured, face-to-face interviews were not found in the open response prompts. However, open codes used during analysis of the open response prompts were determined to be a part of the most dominant themes.

Analysis of the focus group interviews provided me with similar codes to those found in the open response prompts, as well as some unique additional codes. Given the nature of the focus group interviews, participants elaborated on specific details of the experience in remedial mathematics. Specifically, analysis of the focus group interviews revealed the following codes: embarrassment with enrolling in remediation, a belief that remediation provided a strong foundation in mathematics, and participants were motivated to learn. Although similar codes were determined in the other data sets, these codes were specific to the focus group interviews. The more prominent codes helped to illuminate the most relevant themes.

Semi-structured, face-to-face interviews were analyzed, and open codes were developed. Open codes created through analysis of the semi-structured, face-to-face interviews were found to support the more prominent themes for this study. Where analysis of the semi-structured, face-to-face interviews provided open codes similar to analysis of both the open response

prompts and the focus group interviews, some open codes were specific to the interviews. Those codes unique to the semi-structured, face-to-face interviews were parental support and influential people, and were determined to be a necessary piece to a successful experience in remedial mathematics.

Themes were derived through the triangulation of open codes across the open response prompt, focus group interview, and semi-structured, face-to-face interview data. Those themes most prominent had data points across all three data collection items. Triangulation was determined by calculating the number of times each individual open code was present in each individual data collection procedure. Then, the total sum of each open code was calculated.

To determine the most salient themes necessary in experiencing success in remedial mathematics, codes were placed into categories based on similarity. I found certain codes to be in themselves relevant due to the emphasis participants placed upon them (i.e., higher education is important). Although not every code was determined to exist across all three data sets, nearly all themes were represented by open codes during all three data collection procedures.

Response levels for each theme varied across the data collection procedures. Analysis revealed that several codes supported the most dominant theme, sense of community, and open coding revealed several data points falling within this theme. Participants emphasized a community feel, finding value in helping others, the comfort of the class environment, and the importance of working with peers. Similarly, open codes triangulated across all three data collection procedures illuminating the second most dominant theme: belief in the value of remediation. The open code, supports future courses, was triangulated and supported this theme. Yet, other open codes, such as foundation for college math and strong foundation were found to be significant during focus group interviews, but responses for these codes were limited or did

not exist during open response prompts and the semi-structured face-to-face interviews. All other themes found to be a necessary aspect to experiencing success in remedial mathematics were determined in this same way.

One necessary aspect of experiencing success in remedial mathematics was the emphasis on academics by influential people. Although this theme was not found to exist across all three data collection procedures, participants made it very clear that their parents, other family members, teachers, and counselors impacted their belief in the importance of education. My interpretation of the data was that students would not have had the same successful experience had they not had these influential individuals impact their lives.

Research question one. In research question one, I sought to examine the types of experiences that influence students to succeed in remedial mathematics. Those experiences that influenced participants' success included previous math outcomes, quality teaching provided prior to remediation, and an emphasis on academics by influential people. Each of these themes is discussed below supported by participant responses.

Previous math outcomes. Students described that their motivation to succeed in remedial mathematics was influenced by their earned outcomes in math classes prior to remediation. Two subthemes emerged, indicating that both success and failure prior to remediation provided them with motivation to succeed. Successful experiences positively impacted student self-efficacy, while unsuccessful experiences motivated participants to improve and perform at a higher level because previous outcomes were not indicative of their ability. Self-Description Questionnaire results support this theme where participants described themselves as being good at mathematics, yet the participants were split in describing their

excitement about math. Half of the participants claimed to have never been excited about math, while the other half described themselves as having been excited in the past.

Success prior to remediation. When describing their experiences prior to remediation, participants highlighted moments in their past that increased a belief in their ability to be successful in mathematics. Those participants whose history with mathematics had been successful discussed the impact their experiences had on their self-efficacy and confidence. Each student who had previous success was able to point to specific aspects of their math history that impacted their performance in math remediation.

Andrew, when discussing prior mathematical experiences, indicated that he had always been confident in his mathematical ability. He stated, "Ever since I can recall, I felt it was like math again, and I've been good at it." He continued, "Not that I do it as a hobby, but it's something that I'm like, 'Oh, fun,' you know . . . like, 'Oh, let's see . . . and I wanna know how it works.'" Andrew went on to explain his prior success influenced his future success "because, on a personal level, I always wanted to understand what was going on with this."

Bethany described a challenging course from high school that influenced her success and prepared her for remediation. She explained, "In high school [during] my senior year, I took Trigonometry and Calculus and it was like the hardest math class I've had . . . it, like, made me work a lot harder for the class and everything." She further explained how it influenced her success in remediation saying, "Math classes before that were kind of easy, I didn't even have to really think about it. It wasn't just like: 'I'm just gonna get through it like, without having to actually work for it.'"

Colene discussed her struggles with mathematics prior to remediation in college, saying, "I've always had a tougher time, I guess, in math classes . . . It's something I've had to work at

and like always, I've always had to put extra time into it." However, she believed the struggle with comprehension showed her what it would take to be successful. She explained, "[My struggles] made me have like a pretty good, I guess, work ethic I guess for math. You know, like how to do stuff, and like how to set it up. I guess really how to ask questions." So, even with her difficulties, Colene stated, "I've always done pretty well in them."

Donna's experiences in math courses prior to remediation were always positive and successful. She described prior experiences as "pretty easy" and said, "It wasn't much of a struggle." Donna explained further that success in those experiences influenced success in other classes and provided confidence in her ability. She stated, "Other students definitely sought me out and asked for help… I think it definitely helped me to even excel in other classes."

Evie had a similar experience to Bethany with a difficult course and an instructor whose teaching style was difficult for her to follow. Evie stated, "I had a geometry teacher, and that's like a tough math for me. I'm like basic—I like the simple math equations—but geometry was like one of those . . . I just didn't do so well on it." She explained further:

> So it was a lot harder… It was my sophomore year of high school, and [it was] my first time going to a school because I was homeschooled previous times. And, so first time going to a school with a teacher, and he had high expectations for the class. It was definitely one that I had to work a lot harder on.

Evie explained that she rose to the challenge: "I just really wanted to succeed in it, and so I tried everything I could to be able to get to that . . . to be able to pass the course and just do well."

Farah discussed a mathematics competition that influenced her success and instilled confidence in her mathematics ability. Farah said, "In high school, I went to the Third

Mathematical Olympics in Honduras. So it was great, I got the third place." She discussed the effort necessary to earn that placement saying, "I practice problems two months before,"

Gretchen felt that she was influenced by having success in previous classes that were considered more difficult than the required remedial mathematics course. She explained:

> Senior year, I was in pre-Calculus, so I went freshman year, it was just regular Algebra and then went up from there. And so from being a harder math course and then going all the way back down to the beginning to [remedial mathematics], I felt confident.

Gretchen elaborated saying that due to having previously studied higher-level mathematics, "It helped me focus when I got to [remedial mathematics], to take my time. And I felt more confident because I knew that I knew higher math."

Failure prior to remediation. Participants explained that prior failures also influenced their success in remedial mathematics. Negative experiences motivated participants to work harder, to persevere towards an affinity in mathematics, and prove their history was not a true indication of their ability. In each case, the participants' experiences shaped their view of mathematics and had a positive impact on their remedial math course.

Heather had a difficult time in high school with Algebra II and needed to retake the class in order to graduate. According to Heather, "I've never been really good at math." She continued, "It was always a subject I didn't really like just 'cause I struggled with it." Having taken Algebra II twice, Heather discussed that it led to her having higher confidence. She stated, "It kind of gave me a little bit more confidence." Further, she said, "I already knew the material, but it was kind of like, some of it I knew, so some of it was a refresher and I could help others in the class."

Jason, who was home-schooled, discussed his dislike for mathematics. Although he had no direct "failure," he focused on the fact that his experience with mathematics was negative. Jason said, "I've never enjoyed math," "I never cared about it," and "It was never a positive thing for me to do." However, he made it clear he wanted to find use for mathematical skills. He said, "I actually really wanted to like doing math . . . [but] there were some things that I just never understood the practicality of." Further, he continued, "I always wanted to enjoy math because I knew that there were problems that I'd have to solve using it."

Kelly's previous experience with mathematics was negative; she used the word "hate" to describe her displeasure for the topic. She discussed having a "mental block" when it came to math and how she would "cry over [her] homework for quite a long time." She felt her work leading up to the SATs had been a failure because of how she scored. And, although using teaching textbooks "helped [her] get around [her] mental block and [she] began to like math," she stated, "When I took the SAT and ACT and bombed both math sections of it, I realized it wasn't the best program for normal life problems." Because her score was below a 19, Kelly said, "This one was like, shame low for me." Kelly stated that this failure motivated her to be successful in remediation because "it wasn't indicative of [her] ability."

Quality of the teacher prior to remediation. Participants indicated that their success in remedial mathematics was influenced by quality instruction experienced prior to attending college, as well as the quality of the person who did the teaching. In their responses, participants discuss the importance of instruction and the support received in mathematics prior to remediation at the college level. Their experiences ranged from discussing the importance of quality teaching to specific examples of how quality teaching influenced their success. Responses supporting this theme are provided below.

Andrew stated, “Probably what helped me the most was the quality of teaching that I’ve gotten so far.” Andrew emphasized this by saying, “once you lead students into a simple understanding of the logic in math, your brain starts to function in a way that connects your professor’s analogies and examples in class.” Andrew summarized the influence prior teaching had on his success by saying, “the good experience I’ve had with people who have been willing to make me or help me understand math overall” was very positive.

Bethany indicated the quality of teaching she had in high school was influenced by her admiration for her teachers and the support that they provided. Her admiration was clear when she stated, “I loved every math teacher that I had at my high school . . . They were willing to work with you on everything and anything.” She continued, saying, “If you have questions, don’t hesitate to ask” because the teachers were supportive and approachable. Likewise, Colene indicated the importance of prior instruction by simply stating, “I had really great teachers.”

Donna also discussed how influential previous teaching was to her success in math remediation. She stated that her success was influenced by “just having good teachers previously in high school and even middle school.” She explained the importance of prior teaching further by saying, “Definitely, a positive aspect would be the teachers. They were all kind. Then I grew up, and they knew exactly what I struggled in.”

Evie supported the necessity of having good high school teachers who pushed their students to succeed. Having spent time during high school overseas Evie said, “I had some teachers that just didn’t seem that they cared at all. But, most teachers over there really love what they are doing.” Therefore, she said, “I had a lot of teachers that were really wanting to see their students strive.”

Farah discussed the support provided to her by one of her elementary teachers. She reflected on a specific conversation with this particular teacher by saying,

> One day we were playing . . . I will never forget that too. We were playing soccer, and suddenly we started talking about numbers because I asked him, "How was my test?" And he's like, "I cannot be more proud of you because you're getting so good. Keep doing that. I bet that the Lord has something for you and we never know. We can find a scholarship for you to go and study. But just keep going.

Farah described the impact this had on her success then and later in college. Farah explained, "He just believed, and he said, 'I don't have the resources now, but we can find out. And just keep doing. Your math skills are so good.'"

Gretchen reflected on her favorite teacher during her senior year of high school and the atmosphere the teacher created influencing student success. Gretchen said,

> It was really cool. We'd do math—it was hard math too—then we would take a break and she would kinda talk about herself and it would be kind of like fun. The environment of the class felt comfortable where you can ask questions if you were confused.

Gretchen summarized the importance of the created environment stating:

> Whereas some math courses where you have a professor or a teacher . . . it was kind of timid in the class and you kind of were scared to speak out because you just look so highly of them and they're super intelligent. And you're like, 'I don't want to ask a dumb [question].'

For Gretchen, that class and teacher motivated students to seek clarification and ask questions because of the environment created.

Heather described a similar teacher whose instruction influenced her success when she stated, “My senior year, my math teacher was really good.” She elaborated by indicating why. Heather stated, “She really influenced me . . . she was available a lot and that was motivation to me to do better because I knew I would have help.”

Jason’s experience with quality teaching was unique due to being home-schooled by his mother. He was quick to say, “My mom hates math.” Yet, he qualified this by saying, “She hates math and she’s not good at math, but she always put a lot of importance on learning math.” He continued by saying that he saw a personal application for mastering the subject. Jason stated, “I always intended to go into sciences, and she was always quick to point out that I would need to know lots of math.”

Kelly’s previous experience with math education was similar to Jason’s because she, too, was home-schooled by her mother. Kelly discussed the instruction provided by her mother saying, “When she knew I was struggling, she would get different things to help me out.” Kelly continued, saying that her mother “would get tutors” and “use teaching text books.”

Emphasis on academics by influential people. Study participants indicated the influence significant people had on them and their academic journey prior to attending college. Whether it be their parents, family or a counselor, each participant indicated how someone had impacted their belief in the importance of academics. Participants were impacted by an increase in curiosity and a need to be financially stable. Further, influential people made an impact on participants and their belief in the importance of their education due to the significant support they provided. Participant responses in support of this theme are provided below.

Andrew discussed how his father fed his curiosity for knowledge and learning new things. He explained, “My dad always told me, ‘Hey, read this,’ or, ‘Read that’ or, ‘Do this’ or,

'Watch this movie.'" So, he helped in the beginning, becoming curious about information [became] part of me." Andrew also emphasized the importance his mother placed on education when he stated:

> My mom has always been the biggest one who's been like, 'Education's gonna get you.' She and one of my aunts, just 'cause, she's like my second mom. They're both like, they support education 100%. They've always been, 'Just do it. You'll see, you'll see.' And then that's pretty much how I got to this point, I guess. I was being motivated and knowing the value of it.

Bethany described the great importance that her parents placed on higher education when she said:

> It was really important [to attend an institution of higher education]. When we were growing up, that was our only option. Whether we wanted to go to college or not, our parents are gonna make us go. It wasn't a choice, it was, 'You're gonna do it.'

Bethany's upbringing, specifically her parents' education level, influenced her parents' emphasis on college attendance. She explained:

> Watching your parents who didn't go to college, they just graduated high school. I go watching them and seeing what everything they are going through and not [being] able to afford certain things and then them feeling bad about it . . . It makes you want . . . They tell you they want better for you, and you see everything that they're going through.

Colene explained that her education was influenced by a high school counselor who invested in her and showed interest in her education when she said:

> My counselor in high school . . . she and her husband always would take me out to eat and stuff like that and ask me how I was doing if I just didn't have enough time to talk

> with her in school, I guess. And so even now, they always, you know, ask me how I'm doing and stuff. You know, to keep on the path to doing good in school.

When asked why they were invested in her—whether it was because of the importance of education or because they wanted her to be successful— Colene said, "Well, I think both."

Donna's parents emphasized the importance of having an education, especially earning a college degree. She stated, "Being able to go to a university . . . [it] was of big importance to them that I would actually go, 'cause it was an opportunity that my family really didn't have." Consequently, Donna said that while she was growing up, her parents "definitely put a strong importance to make good grades and to seek out all the opportunities I can to get into a good college like this."

Evie stated that education was important to her parents. She discussed their influence saying, "My parents always encouraged it. They told us how important it was to get a higher education so you can get a really good job and specialize in something."

Farah discussed how her father helped develop her belief in the need for education in his effort to make sure she attended school. She recalled:

> My daddy was always making sure that I had what I need to go to high school. I had every day to wake up at 4:30, get ready at 5:00, and walk for two hours, and going to high school walking, and then going to high school. And then I was done with my classes at 1:00, and then by 4:00, I was home. And my daddy sometimes, when he was kind of seeing that it was about to rain, he would go just with umbrella or with something and say walking, yes. And we'd meet halfway. There was no cell phone to communicate. He'd just go and try to find me.

Gretchen's parents were an influence on her belief in the importance of education as well. She stated, "It was important, but the thing I liked was [that] they weren't super intense with like, 'You need to get As and Bs a 'C' is unacceptable.'" She continued saying:

> My parents would give me a reward if I got all As; They'd give me maybe like a present or money, or something, but they would still be proud of me for my capabilities, which I think helped to not discourage me, like get so stressed over that I got a bad grade on a test.

Heather's parents had an impact on her belief in the importance of education. When asked about this, she said, "My parents were a huge influence." Further, she stated that her parents were "very supportive of anywhere I chose to go [to college]." She continued, saying, "[My parents were] just really pushing me to go to college, just wherever it could be."

Jason stated that his mother was the most influential person in his life regarding the importance of an education. He recalled, "She thought that it was a very necessary thing for us to go to college so that we could get good jobs, [and] so that we could make plenty of money to support a family."

Kelly discussed how important it was to her mother for her children to do well in elementary school and beyond. She stated, "It was important for my mom for us to make it through elementary school and through high school… to graduate from high school." Kelly continued, saying, "She wanted to be a good mom . . . she's home-schooling and she didn't want to fail us. So, she made sure we did our homework and developed mentally."

Research question two. In research question two, I asked what beliefs influence remedial mathematics students to succeed. Two main themes resulted from my exploration of this research question. The first theme was a belief in the importance of higher education. The

second theme, a belief in the value of remediation, emerged from the data with several sub-themes: (a) foundation for college mathematics, (b) supports future courses, (c) and provides a strong foundation.

Belief in the importance of higher education. Participants believed that a college degree was extremely important for meeting their future goals. In many cases, participants believed that it was completely necessary to be hired in the profession of their choice. Further, participants believed that a college degree would provide them with financial stability.

Andrew believed that higher education not only provided one with the ability to be employed, but also offered the opportunity to have a holistic understanding of a chosen profession. According to Andrew, attending a university was "very important because, with the very core of it, I mean of course it's easier to get a job with it." Specifically speaking about his chosen, major Andrew said:

> There are some things that you need to learn if you want to be good at [your chosen profession]. Some filmmakers, they don't even go to school [to learn the film business]. But then the difference is how much [you want to learn] and where you want to go with it . . . all that creativity you have, it's . . . You need to know how to put it in order.

Andrew concluded his remarks about the importance of higher education by saying, "That's why it was important to me, because I knew that I need to learn . . . I still do. Everyone needs to." Further, Andrew said, "I consider college important because it does help you to open your eyes a bit more to what's out there for you."

Bethany saw the importance in a college degree due to the financial stability it brings. Bethany's parents made it an expectation stemming from their own financial issues. According to Bethany, "It was really important" to attend a university. She continued, "Growing up, that

was our only option. Whether we wanted to go or not, our parents are gonna make us go. It wasn't a choice, it was, 'You're gonna do it.'" Bethany explained:

> Watching your parents who didn't go to college, they just graduated high school . . . seeing what they are going through and not able to afford certain things and then them feeling bad about it. It makes you want . . . They tell you they want better for you and you see everything that they're going through.

Bethany continued, "I think it's really important, 'cause not only I have a degree, I have an education, I will be able to get a job, especially in the field that I'm going into." Bethany concluded by saying, "For me, the degree is kind of like doing something I love while being able to take care of everything else."

Colene saw college as an opportunity to be the first person in her family to earn a degree. According to Colene, "It was really important because I'm the first one in my family . . . to go to college. So I mean, it's pretty important to graduate and go through with it." Further, Colene saw earning a degree as an aspect of financial stability. "I've also seen what it is to live pay check to pay check. So I really don't want to do that," she stated, continuing, "having a college degree is pretty important."

Donna believed that a college degree was essential to acquiring a job in social work. When asked about the importance of attending a university, she stated, "It was really important to me… You can't really do social work without having a degree in family and human services or a degree in social work." She emphasized the need for a degree by saying, "It was really important that I did go to college 'cause otherwise that would be really difficult." She concluded by saying, "It's really hard to get a good job out there without a college degree."

Evie held the same belief as Donna regarding the importance of attending a university. According to Evie, attending a university "was definitely important." When asked if it was something she always wanted to do she said, "It was just something . . . my parents always encouraged it too." Evie continued:

> [My parents] didn't want to force us to anything that we didn't want to do, but they told us how important it was to get a higher education so you can get a really good job and specialize in something.

She concluded by saying, "I've always wanted to be a nurse, and to be a nurse you have to go into higher education . . . I have to graduate and get a degree and a license before I can actually work."

Farah felt that having a higher education was essential to finding employment when she returned to her home country. According to Farah, "For me, it was important because now, even though [my country] is not a developed country, but companies or organizations or whatever we wanna apply to for job, they are asking for a college degree." She further emphasized the need for a degree saying, "With my high school diploma, I wouldn't be that person that I wanted to be, like getting opportunities to apply for a higher job or something like that."

Gretchen never thought of any other path other than attending college following her graduation from high school. She said, "It think it's really important 'cause I never thought of not going to college. I always thought of it as a priority." Gretchen knew nothing else. She added, "I didn't think it was an option to not go . . . I always thought like, 'Yup, after high school go straight to college and then get a job.'" For Gretchen, attending college was a "natural progression." Further, she discussed how earning a college degree was important to her when she stated, "I want to get a college degree because it's a goal I've always wanted . . . and it would be

good towards obviously a job. And I know going to college will help jobs." She concluded by saying that ultimately earning a degree and attending college was "my own self-motivation of me wanting it."

Heather had always believed attending a university was important. Further, it was something her parents had always wanted for her. According to Heather:

> It was really important for me. My parents always kind of told me that. I mean, they didn't give me an option. But they were like, 'You have to go to school,' kind of thing. I wanted to anyway. It was really important to me 'cause my parents didn't go. That's why they kind of pushed me: 'cause no one pushed them to go to college. They wanted to push me to go to college 'cause they knew how important it was.

In terms of the importance that a degree holds for Heather's future, she stated, "It's very important… I have to get it to do what I love." She also believed that having a degree would provide her with a more lucrative future, saying, "I might get paid more."

Jason's perspective on attending college was different, yet he still thought it was a great opportunity. "I didn't have any other opportunities right in front of me. There wasn't anything else," he stated. Jason's attitude towards attending college was directly affected by his own father's experience. He explained, "My dad went to school for geology . . . and that was a really hard time for him and put a lot of strain on everything money-wise and emotions-wise." Jason continued, "It was just a really complicated time." Yet, Jason added, "It's obviously way different now, actually being here. It's a totally different story. I'm on a good track right now." When asked specifically about the degree he would earn, Jason defined its importance by saying, "I think it's . . . if nothing else, a great experience" and "I think this is definitely the way to go."

Kelly placed the importance of attending college directly on how necessary it was to become a nurse. According to Kelly, attending an institution of higher education is "for a nursing degree, quite important." Further, she added, "I really like having two years of liberal arts before two years of nursing school." Kelly saw her degree in nursing as a starting point to her future career and explained its necessity by saying, "What's more important is my nursing license… a college degree is gonna get me there."

Belief in the value of remediation. Participants expressed their thoughts about the value of having to remediate due to the foundational aspects of a mathematics course. Participant responses discussed the knowledge gained from having to enroll in remediation and how it provided a solid mathematics base moving forward in their academic journeys. As discussed below, the participants felt that a solid mathematics base positively impacts future math classes, other quantitatively based courses, and their futures in general. Participant responses supporting this theme are provided below. Self-Description Questionnaire III results supported participant beliefs in the value of remediation in that participants described themselves as being generally good at mathematics and having strong feelings of adequacy with their mathematical ability.

Foundation for college mathematics. The study participants discussed the importance of remedial mathematics as a foundational aspect of college mathematics. Remediation was viewed as being a valuable experience, given that it provided students with the skills necessary to perform at a high level in college level mathematics. Further, some participants felt that they were set up for success because of their familiarity with the material.

Bethany believed that remedial mathematics provided her with the skills for future math courses. She said, "I realized that a refresher was a good thing because it would remind me of things I would need to know for my upper-level math classes."

Donna discussed how mathematics is sequential, building upon itself. When asked if remedial mathematics was a strong launching point for increasing one's math knowledge, she said, "Yeah, 'cause of statistics and other classes like that." When referencing the statistics class, she was required to take following remediation, she stated, "Math kind of builds on top of each other" and "you have to . . . know how to do the math correctly,"

Evie explained how she felt that she had a step up on other students in College Algebra because she was required to remediate. According to Evie, "It really helped because I was familiar with it, and I felt like I was a little . . . like after taking [remedial mathematics], I felt like I was one step ahead of the people in Algebra, College Algebra." She continued, saying, "I felt like I could actually help them as well because I was able to remind them a little bit of the College Algebra, or like the Algebra they'd forgot throughout high school."

Farah discussed how remediation provided a base for future mathematics courses. She stated, "I think [remedial mathematics] is just the base. Like when someone is building a house, it's much better with a good base." Farah continued, "The foundation has to be strong [because] that base is always helping."

Gretchen, who had taken higher-level math courses prior to college and having to remediate, also felt strongly about the course as a foundation for college-level mathematics. Gretchen said, "The foundations, yes, you need this simple math to get up to the higher math." She reiterated this by saying, "When you get up to the higher math, you need to remember those little steps, so you don't mess up."

Jason felt knowing the material from remediation would helpful when taking College Algebra. According to Jason, "I know the material of it would definitely be helpful if I was

going on to College Algebra . . . just the kind of concepts and learning skills that I got from that class were helpful."

Heather strongly believed in the benefit of remedial mathematics. She stated, "it prepared me for College Algebra, for sure, so I think that is a very big plus." Further she felt that her success in College Algebra was more profound due to remediation. Referencing its impact she said, "If I wouldn't have taken that, I probably wouldn't do good in College Algebra."

Supports future courses. Support for future courses was evident in how participants described the impact remedial mathematics had on other college courses that included math content. Regardless of the course, if it was quantitative-based, then participants described how helpful it was to have remediated prior to those courses. Participant responses supporting this theme are provided below.

Bethany stated that remedial mathematics "made me realize that like, even though it started out me thinking negatively, I ended up being grateful for being put in the class [because] it helped me further on." Adding to her thoughts, Bethany said, "It helped me when I took Chemistry because I had a solid foundation of the whole Algebra thing."

Donna expressed being frustrated with needing remediation, yet found value in the course. Donna said, "I was a bit frustrated that I had to take it, but I knew that I had to take statistics at some point in college, so I knew it would help me in the long run."

Evie was happy in the end that she was required to remediate because of how the class supported future courses. She said, "I'm happy I took it because I was able to do chemistry really well."

Provides a strong foundation. Participants discussed the general importance of having to remediate in mathematics and how it would benefit them in the future. Whether they spoke

specifically about their ability to perform mathematically or about how it would impact their future vocation, participants made their belief about the importance of understanding math at a later time in their lives clear. Generally speaking, the belief conveyed by participants was that mathematics ability is something they would need beyond college.

Evie felt, in hindsight, taking a remedial course provided a strong foundation in math. Although she was not happy about remediation, Evie said, "Looking back, it was a good review because I haven't taken a math course in a couple of years prior to it." Further, Evie stated, "[remedial mathematics] is that foundation to be able to succeed in the math like for the future."

Farah felt that math remediation supported her future success in business. According to Farah, "Math is the base; it's essential to be successful in business." When referring to what she learned during remediation she said, "That is gonna help me through different problems that I may face in the future." More than this, Farah saw remediation supporting her future in general. According to Farah, "You always need math [and] it is used in daily life."

Gretchen agreed with Farah regarding mathematics and daily life. Referring to mathematics she said, "Just a simple math, and like you're saying, use it daily that you need throughout our lives."

Heather discussed frustration with the need to remediate, but valued the review. According to Heather, "It made me feel confident in math again. I was negative at first, but then quickly realized that it was more beneficial to me to relearn the material." Further, Heather stated, "I think it will just help me overall because you always have to know those things. Like, you'll have to use it."

Research question three. With research question three, I asked: What are the factors that motivate remedial mathematics students to succeed? Themes resulting from research

question three included (a) sense of community, (b) change in attitude, and (c) motivation due to mastery and performance. Each theme, with participant responses, is provided below.

Sense of Community. Participants described how their remedial math classes had a comfortable community feel. They described a lack of judgment due to enrollment with regular peer interaction both socially and academically. Two subthemes that emerged from the data were: (a) common ground, and (b) peer work.

Common ground. Andrew described the make-up of his class based on strengths and weaknesses. He indicated how his comfort with the class increased knowing that he and his peers were different, but each person had something to contribute to the group. According to Andrew, "It does help to know you have a variety of people because that way . . . some people know a lot more about these kinds of things, and some other people know more about [other] kinds of things."

Bethany felt a sense of common ground on the first day of class via the instructor's comments, which set the tone early. Bethany recalled the instructor saying, "Everybody is here for different reasons. We all are in there, though, because we needed the extra help. But the reason behind that doesn't matter." She continued, "[The class was] gonna build a stronger foundation and be able to move on, and just work harder and . . . get through this and everything else."

For Colene, the comfortable atmosphere stemmed from humor created by classmates. Colene stated, "I think that's pretty good because everybody . . . I felt like was really funny." Therefore, according to Colene the class felt "light and easy going."

Donna felt the atmosphere was comfortable because each person in class had a common variable: They were required to remediate. Donna said, "Everyone there was in the same boat."

Because of this she said, “No one is judging you or thinking, ‘Oh, that’s the answer? What were you thinking?’” She continued, “I viewed my peers as the same as me and helped them when they had frustrations, just as they did with me.”

Evie addressed feeling common ground with other students via conversation with the instructor. When discussing her disappointment in being placed in mathematics remediation, she recalled, “[The instructor] told me, ‘Well you’re not the only one in this boat, like everyone here probably is thinking that.’” Further, Evie stated, “Everyone was in the same boat, and so we’re all learning together.”

Farah simply stated that she found common ground by being included and building relationships with her peers. She stated, “My classmates were really nice. I felt included.” Farah also emphasized the importance of relationships with classmates by saying, “Building that relationship while we were knowing each other, we were learning together.”

Gretchen felt that having a common ground with her remedial mathematics peers provided motivation to succeed. She said, “It was motivating ’cause people were in the same boat. Some people were struggling, some people had higher knowledge of it before coming in… it was a good community of students.” Gretchen further emphasized the sense of community that she felt when she added, “In [remedial mathematics,] were people who would ask certain questions that I didn’t think of, and they would ask really good questions.”

Heather discussed she felt a common ground with each student, given that she and her class peers relied upon each other. Heather said, “[Peers] motivated me to want to do better. To be there if they needed anything also” She elaborated, “I didn’t want to be like that person that was like having to lean on someone else. I wanted to be that person [they leaned on].” Yet,

according to Heather, "[A classmate] really influenced me to do better . . . she would help me and kind of make me better understand it."

Jason reiterated Heather's sentiment with regard to working in a community of peers who held a common ground. Jason said, "Overall, I guess, you know, like the people who were in more advanced classes [prior], I never really felt any peer pressure about it." He continued:

> If I had a partner or partners that were really good at math, then I would just kind of piggyback off, of what they were doing . . . If there were people not as good as I was, then I could step in and help them.

In this way, Jason felt he and his peers had built a give-and-take relationship and a bond.

Kelly found common ground in group competition. She found motivation in their competitiveness, which rubbed directly off on her. She said, "I had two people in my group that were extremely competitive, and some of that rubbed off a little more on my already competitive streak . . . [We] wanted to be better than everybody else." That common ground was strong in that Kelly felt compelled to aide her group in besting others. She explained, "[I wanted] to please my group members because they wanted to be the best."

Peer work. Andrew described having motivation due to in-class peer work. He described the peer work by saying, "[The instructor] was rotating us, like groups that helped to like, not just rely on someone." According to Andrew, because of this, at some point, "you had to take over and kind of like be a leader and actually pay attention to class because other than that, you just rely on other people, which is not what you're trying to do."

Bethany recognized that working with peers and having to explain course concepts was a way to determine just how well one understood the course material. According to Bethany, "If you understand it well enough to explain to the other people in your group with you, then you

actually understand it. You're not just like, going through the motions." She emphasized this by saying, "If you're explaining it to someone else, it shows that you have . . . a clearer understanding of what you're doing."

Donna also felt that working in groups with peers was motivational. That motivation came from the ability of others to step up when they had a better understanding of course concepts or vice versa. Donna said:

> If one person didn't really know how to do one problem, then odds are, there's gonna be another person in that group that actually knows . . . that could probably simplify it more and make it able to connect in our brains.

Evie focused on a specific peer with whom she worked in class throughout the course. This relationship was a steady support for Evie. According to Evie:

> She and I, like, we would take problems and just break it down together and just, like, go through it and try to test each other too. And so we both were writing alongside each other trying to, kind of, do well in it.

Evie continued, saying, "She kind of like helped me to keep my stamina through the whole semester."

Gretchen emphasized the different positive aspects of working with peers and how she was motivated by those variables. Gretchen described those features when she said, "We could do problems on our own and go reflect on each other, and help each other out in that way." Gretchen added, "You were the teacher, and the other person was the student . . . you were explaining it to your partner if they didn't understand it."

Heather suggested that she was motivated by peer work due to the possibility of embarrassment. She said, "[peer work] helped me because I'm like, 'Oh no, I'm in a group of

people who I don't know at all.'" According to Heather, "It just makes you more confident. You're like, 'Okay, I have to learn this so I don't look dumb in front of everyone.'" Heather summarized her motivation by saying, "I didn't want to be the weak link."

Farah discussed how peer work influenced her motivation because of her comfort level with classmates and how it provided opportunity for clarification of course concepts. She stated, "It was really great because at first, I was kind of nervous or kind of shy because I didn't want to talk." Yet for Farah, that nervousness subsided with her peer group. She explained, "I wasn't scared about asking questions . . . one of my partners, she's like, 'Do you understand?' I said, 'Not really.' 'Do you want me to explain?' I said, 'Yes, please.' [Then] she explained it in her own words, and I understood better." Farah explained further about the importance of working with peers and their support referencing a classmate, "If I wasn't done, she would help me and explain to me why or how to do it."

Kelly contributed part of her success in math remediation directly to working with peers. According to Kelly, "working with partners and figuring . . . teaching, helping learn, but teaching what I knew to another person who could then teach something to me" was a motivating factor. Kelly expanded upon this idea by saying, "I also know that teaching helps solidify it for myself. If I know something that somebody else doesn't, then I can go over and I can be like, 'Okay, this is how it goes.'" Therefore, she concluded, "Helping others was a motivation."

Jason felt that working with peers was beneficial due to the interaction amongst classmates on a more personal level. He said, "It gave the whole thing a more personal feel as opposed to sitting in rows of seats and everybody does their own work." Further, Jason said, "You'd be talking back and forth, and they'd know something you don't, and you could swap ideas." According to Jason, the personal feeling was enhanced when working with classmates

who "just kinda make jokes, and make the whole thing lighthearted . . . just made it go with the flow."

Change in attitude. Change in attitude, a theme that emerged, indicated that each participant's success when enrolling in mathematics remediation brought feelings of negativity, but quickly turned to valuing the experience. Negative feelings stemmed from nervousness due to self-efficacious beliefs, comparison to others in the course, and disappointment with standardized test results. However, each participant found the experience to be positive, changing their attitudes from frustration to appreciation.

Citing his unease about attending math remediation, Andrew said:

> At first, it was quite scary since there is a sense of not knowing what might happen… it's like, you walk in and you don't know like, 'Oh, I'm assuming most people are gonna know a lot more than me.'

Andrew also shared that he felt a stigma amongst his peers when he said,

> [It's] kind of like you're taking a step back, instead of taking the usual . . . I mean, it's just sometimes the name, I guess. Because I did feel like that, to be honest, too. It was, like 'What are you taking?' I was, like, 'Algebra.'

Andrew continued, "It had to be like that, I would leave that out . . . it was just sometimes the name that makes it look like, 'Oh, it's not as complicated as College Algebra.'" However, Andrew described his attitude towards remediation as having changed when he stated,

> At first, I was a little bit negative [about remediation]. But then as I took it, I was like, 'Okay, all these things are fresh in my mind. So, for next semester, I can just go back to these things.' I still have my notes. Just 'cause I didn't have the guts, it's just like to throw them away. These feel super useful.

Bethany began the class at a low point. Bethany said, “I was kind of disappointed because of my ACT score and how low I scored on it.” She continued, “At first, like the negative feeling is just like, the first day you’re in class you have the feeling.” However, Bethany, changed from being negative about enrolling in remediation to appreciating the course. According to Bethany:

> Starting back at a point where I may have like missed steps in it, that caused me to hate it. I took that class, and it started helping me actually understand it a lot better than just kind of doing the work because it is given to you.

Bethany explained further:

> The class is something that you have to take your time and make sure you go through the correct steps . . . It made me realize that like, even though it started out [with] me thinking of it negatively, I ended up being grateful for being put in the class.

Colene held the same sentiment for mathematics remediation as Donna. Colene said, “Finding out that — ’cause it was a lot of hard work having to learn all that stuff — to find out that you didn’t get credit for that, too? That kind of sucked.” Yet, when asked whether having to take the class was worth it, Colene responded:

> Honestly, I don’t want to, but I think that it’d be kind of important, because of that class, for everybody to at least take a math class every year . . . I think it is really important, even though I don’t like to do it.

Donna was unhappy with her standardized test scores that required her enrollment in mathematics remediation. Donna stated, “I didn’t want to take it. I was really upset that I didn’t do well enough on the math parts of the SATs, so I didn’t want to be there.” Yet, she explained how her attitude changed. According to Donna: “That was more negative, but I realized, ‘Okay,

I was gonna have to take statistics later on, so it will be good for me to take this class so I'd actually do better later on in college."

Evie was even more disappointed with having to enroll in mathematics remediation. Evie said, "I was a little upset that I didn't get a high enough SAT score so, I was a little discouraged coming in." Evie concluded her thoughts about her frustrations with remedial enrollment saying, "I am not understanding this, why do I have to take this class . . . I did all of this in high school." However, Evie shared that her attitude subsequently changed when she stated, "Once I [got] started and realizing that I have an opportunity to, you know, start from the basics… and work my way up and actually grasp these concepts again, it was kind of like a second chance. Evie emphasized this saying, "I grasped that, and be like, you know I can actually get something out of this class." Further, Evie said, "It could be beneficial to the rest of my time in math [and] that kind of pushed me to succeed more."

Farah was also frustrated with having to enroll in math remediation. According to Farah, "It was kind of frustrating at the beginning." That frustration was emphasized by knowing peers who were starting out in their college level mathematics course. Farah said, "I saw my . . . [peers] going to College Algebra, and I was a student in [remediation]." But, Farah quickly changed her perspective on remediation. According to Farah, "And then I said, 'No, this is an opportunity,' Why should I go into College Algebra if I don't know a lot of before?" Because of remediation, Farah believed she would be better prepared for college level mathematics. She said, "I do better. I start again, and it's gonna help me to be better in College Algebra."

Gretchen's negative perspective was due to having taken higher-level mathematics in high school. Gretchen said, "I was frustrated because I was like, 'I was in such higher math, and now I have to go back to the beginning and go at such like a lower math.' [And] all my friends

were in College Algebra." However, according to Gretchen, "I look back at it and I'm thankful I took it [because] going back to the simple math that helped me learn the little steps to get up to the higher math." Gretchen concluded by saying, "Going into it, I was frustrated. But leaving it, I was thankful that I got to take it."

Heather started out in remediation nervously. Heather said, "Just going into [math remediation], I was a little bit scared because I've never been good at math." Heather continued, "Going into this, I was kind of like, 'I don't know about it.'" However, as stated by Heather, "Going on through the course, I just got more and more confident [and] it was really nice to go back to the basics and actually understand what was happening." According to Heather, she was glad to have taken math remediation because of how prepared she was for college level mathematics. Heather said, "It prepared me for College Algebra, for sure, so I think that is a very big plus. If I wouldn't have taken that, I probably wouldn't do good in College Algebra."

Jason began class with low expectations for the course. Jason said, "I had no idea how well I was gonna do taking the ACT. I realized that I really didn't know very much math, so I didn't have high expectations." Jason concluded, saying that his expectations were, "pretty low. Pretty low. I did not expect to do very well." However, Jason's attitude changed when his course outcomes were positive. Jason stated, "Then I started doing well. I wanted to keep that up." Further, Jason said, "Once I realized that I started off doing well and understanding the material in class, it was definitely a morale boost . . . I wanted to keep doing well, in part, because of that."

Heather shared her unhappiness with being placed in remediation due to her performance on standardized tests when she said: "When I took the SAT and ACT and bombed both math

sections . . . compared to my other scores —all of the other subjects which were high—this one was like, shame, low for me."

However, Heather's perspective of math remediation changed. She saw the course as a necessity. She said, "I needed College Algebra for statistics, and I need statistics as a prerequisite for nursing school. [Further,] I have to get good grades in statistics, Chemistry, Cellular Biology, and Anatomy and Physiology." Because of this, Heather believed math remediation was "one step in the process of completing [her goal of becoming a nurse]." More specifically, Heather felt that performing well in remediation would lead to future success. Heather said, "It was important for me to get a good grade and go into College Algebra and then get a good grade." That meant that she "could go on to do College Algebra with the motivation to get a better grade." Additionally, Heather said, "it meant that I had the skills necessary for getting a better GPA in a different class."

Motivation due to mastery and performance. Participants were motivated to succeed due to the need to fully understand course content and its importance for their future. They also indicated a desire to earn a high grade in the course, regardless of the fact that it bore no credit. Participants' responses to the Self-Description Questionnaire III supported this theme. In terms of mastery goals, participants described themselves as individuals who find math problems interesting and challenging, have a lot of intellectual curiosity, and believe they are good at problem solving. Two subthemes emerged: (a) motivation by grade, and (b) motivation by need to understand the course content. Both subthemes equally motivated participants to perform at a high level during their remedial mathematics course.

Motivation by grade. Participants were motivated to succeed because they wanted to earn an 'A' in the course — a performance goal. In some cases, once success was had,

participants were motivated to continue to perform at a high level to maintain and ultimately earn an ‘A.’ Participants indicated that failure was not an option, and earning an ‘A’ was a high priority. The participants’ responses regarding their motivation to succeed due to earning an ‘A’ are provided below.

Colene, due to fear of failure, was clear that earning a high grade motivated her to succeed. She said, “It all comes down to: I just didn’t want to fail, and I also wanted to get a good grade.” Although to earn an ‘A,’ Colene “worked hard at it and studied for it.” Indicating a need for understanding, she followed by saying, “It was more about the grade.” According to Colene, “You know, it’s kind of like, if you do bad in class, you know your GPA goes down. And if the GPA goes down, then you lose scholarships. And if you lose scholarships, your entire life is ruined.” Therefore, Colene concluded that the need to understand course concepts was necessary because she “wanted to get the grade.”

Donna was also motivated to succeed to earn a higher grade, specifically to earn a high GPA. Donna said, “I think GPA definitely played a big role.” Further, according to Donna:

> Just knowing that further on in college it will be important that I have those higher grades and more diligence in the courses that I take ’cause of applications for internships and different things, it will be important for that.

Asked whether the amount of effort Donna put into practice for remedial mathematics was worth it, Donna replied, “Yeah, an A is great. So, yeah, I think it was definitely worth it.”

Farah’s motivation was initially based on wanting to earn a good grade in her future college mathematics course. According to Farah, “In the short run, I would say that to be, or to have a good grade in College Algebra . . . That was my motivation because [my instructor] always says, ‘Okay, you were good in [remedial mathematics]. That’s gonna help you a lot in

College Algebra.'" Farah explained her motivation at midterm when she had earned an 'A' for a grade saying, "I have an 'A,' so it means I can have an 'A' at the end of the course . . . That motivated me to work hard and to end up with an 'A.'"

Gretchen felt that earning a high grade was a nice reward, even though she claimed not to be focused on that outcome. Gretchen said, "I wasn't too worried about the grade. Still, it was a good reward to have it." Yet, Gretchen tried doing well in the course to obtain the grade that she wanted saying, "Obviously I wanna do well in the class."

Although earning an 'A' wasn't Heather's main focus of motivation, but she did admit that it was beneficial. Heather said, "The 'A' was good too."

Jason claimed to be influenced by earning an 'A' as well. Jason said, "One I had an 'A,' I was very intent on keeping that 'A.'" Further, Jason stated, "It was good morale just knowing that I could do that well [and] I really wanted to end the first semester with at least one 'A.'" In referencing his motivation and how it was influenced by his grade, Jason ended by saying, "That was definitely one of the forces behind it . . . that was kind of a fun goal to set."

Earning a good grade was a motivational factor for Kelly. When discussing how her remedial mathematics instructor influenced her to succeed, but she said, "Also the fact that I needed that class done with a good grade." Further Kelly stated, "I got a good grade and . . . even though it was a remedial math course, it's still an accomplishment." Kelly then discussed how earning a good grade meant she could do the same in College Algebra. She said, "It was important for me to get a good grade and go into College Algebra, and then get a good grade."

Motivation by need to understand course content. Participants were motivated to succeed due to their inner drive to understand course content and its impact on their future success not only in mathematics, but also in their general academic future. Mastery of course content was

described as essential to success in remedial mathematics. Further, it was a motivating factor that influenced participant's highly successful results. Participant responses supporting this subtheme are discussed below.

Andrew's motivation to succeed in remediation was influenced by a need to understand course concepts. When asked whether he was highly successful because of the need to earn a certain grade, Andrew said, "It wasn't about the grade, it was about me understanding about it." Further, Andrew stated, "It was just like, 'Okay, just to make sure if I can get this good… It wasn't as much about the grade, it was because I was understanding." Andrew felt it was "very important" to have a strong understanding of course concepts to be successful. He added, "I wanted to learn, [and to do well] you need to understand."

Bethany talked at length about the importance of having a strong understanding of course concepts. When asked about the importance of having a strong understanding of course concepts, she said:

> It was really important because everything was based off of the concept of understanding. It wasn't based off just kind of memorizing how to do a problem or going through the motions. It was more of actually understanding every step that you're going through to get to the answer.

Further, Bethany believed that concept mastery was essential to her success. She stated, "being able to understand it and know for sure the concepts, that's gonna lead on and help you remember and be able to do it for other classes that you have."

Colene was also focused on understanding course content. Colene said, "I was just kind of focused on like, you know, hey, I need to do good in this right now. So, that way I can understand it so I could do well in the class." When asked if concept mastery was essential to

her success, Colene replied, “I would say so, because I mean, I understood it, so I got an A in the class.” Although earning an A was important to Colene, she did believe her effort in the class was worth it because she “knew some stuff coming out of there” and she claimed, “[It] did help me in College Algebra.” At the end of Colene’s individual interview, she shared, “I wanted to do well. In the class at the time, I mean, I was thinking about just doing well, not really about the grade.” She continued, saying, “I mean I wanted an ‘A’ or ‘B,’ but I wasn’t really thinking. I was just trying to, like, make sure that I understood what I was doing.”

Although Donna believed grades were an influence on her motivation to succeed, she emphasized that the work necessary to understand course concepts was motivational as well. Asked whether she was motivated by earning grades or understanding the content, Donna said, “It was more the work I put into it . . . I knew that I had to do it in order to pass the class and then do better later on.” When asked if it is was more than just about earning an ‘A,’ Donna replied, “Yeah, no.” Later asked about the importance of concept mastery during her individual interview, Donna verified its importance by saying, “[It] definitely helped commit this stuff to memory.” In terms of whether it was worth the effort to be so successful, Donna replied, “I think it was definitely worth it ’cause like I’ve said, in different classes, it was important to actually know that stuff.” Donna continued:

> I think at the beginning, it was more . . . I want to just get this grade and then so I can just take the more important classes. Later on, it was more like, ‘Okay, I actually do need to understand this.’ ‘Cause otherwise, I feel like I wouldn’t have been motivated to do the homework and stuff like that.

Donna believed that her motivation to master course concepts would be an advantage for her future. According to Donna, "I'll be able to use it in the future, rather than just completely forget it after I passed it."

Evie's focus on being successful came from an inner motivation: a need to prove to herself that she could learn the content and be successful. Evie said, "I almost wanted to prove it to myself that I can do this." Further, she stated, "The motivation was like, 'Okay, I need to be able to understand this in order to get into [College] Algebra." In reference to understanding the material, Evie added, "I feel like I had a fresh start, in a way. A clean slate. Start over and be able to learn these concepts, I really felt I could actually do that." According to Evie, "So that was like, I need to get confident in this. This is the foundation for the rest of my life. I need to be able to understand this in order to be able to be a nurse." Evie concluded by saying:

> I knew that this was a very important class — it's like the foundation, the very beginning. I knew that if I didn't understand [remedial mathematics], or if I didn't do well in it, then I won't be able to do well in the other math classes that I have to take. I also proved to myself that I can actually understand this.

Farah's motivation also included a desire to learn the course content. Farah said, "I fight in both ways, but I wasn't just for getting an 'A.' I wanted to learn." She explained further, "In math, everything is important. Every transition or every calculation that we do matters, [so] understanding the concept and paying attention to details is really a key to be successful in the class."

Although Gretchen was motivated by the grade she earned, she also felt that her focus was also on mastering the content. Gretchen stated that instead of simply focusing on the grade she earned, "it was more like, 'Do I really understand this? Am I in here for the right reasons?'"

Gretchen further explained the importance of taking remediation seriously and focusing on understanding by saying:

> If you just go in there and not really try and kind of look past it as a not really important course, then you do poorly. You still need to make this a priority and do well and really understand the concepts. I think if you don't understand the concepts and you're just going through the motions, when it comes into bigger problems, those little concepts if you didn't understand that it won't lead you to the other harder problems.

In summary, Gretchen stated, "It was more about the concept of understanding. I know I'm gonna need this for College Algebra."

Heather's motivation stemmed from knowing that remedial mathematics knowledge would help her when enrolling in College Algebra. Heather stated, "A couple of weeks in, I got really motivated because I was like, 'Okay, this will actually help me in College Algebra.' It just motivated me so I could do better in future math classes." She continued by saying, "It was a big motivation, just knowing I had to know the material." When asked if concept mastery was essential to her success, Heather responded, "Fully understanding it gave me confidence and understanding." She added, "Once I grasp this, I can move on to the next thing." Heather finished by saying, "I wanted to succeed to gain better knowledge of the material."

Jason felt that having a strong understanding of course concepts was important. When asked about concept mastery Jason said, "It was really helpful." Continuing, Jason supported this by saying, "I probably wouldn't have gotten an 'A' if I didn't have some concept of it." When probed about whether conceptually, the thought process, learning, and understanding were good things, Jason replied, "Yup."

Although Kelly was highly motivated to succeed in earning an 'A,' she also believed that a strong understanding of course concepts was very important. When asked if her effort in the class was worth it just because she earned an 'A,' Kelly replied, "No, because I needed it. I needed those skills, and so having them meant that I would be able to use them. If I didn't, it would have been really bad." Table 7 organizes each participant into mastery goals, performance goals, or both indicating their achievement goal orientations based on my interpretation of the previous narrative.

Table 7

Participant Achievement Goal Orientations Regarding Remedial Mathematics Success

Participant	Mastery Goals	Both Mastery And Performance
Andrew	X	
Bethany	X	
Colene		X
Donna		X
Evie	X	
Farah		X
Gretchen		X
Jason		X
Kelly		X
Heather	X	

Research question four. Using research question four, I sought to determine how successful remedial mathematics students overcome academic obstacles. Emerging themes answering this question include: (a) quality of instructor, (b) exhaustion of available resources, and (c) persistence.

Quality of instructor. Participants credited their success in math remediation to the instruction received and the effort and care provided to them by the instructor. In their effort to overcome academic obstacles, participants cited their instructor as a main source of help. Whether it was during class or office hours, participants expressed the importance of the availability of the professor and how it supported their academic success.

Andrew believed that his ability to overcome academic obstacles was directly related to how his remedial mathematics instructor taught course concepts. Referencing his instructor's ability to approach a concept from different angles Andrew said, "Teaching how to use this in a different context helps you to understand why math itself works in a specific way." Therefore, "[The instructor] wasn't just saying words that would probably assume that we know just because we're in the class. [The instructor] went back to saying, 'Okay, this happens because of this.'" Further, "Once we understood that, then [the instructor] would actually use those words for the class." Andrew believed this was essential to his success. Additionally, he referenced his instructor's confidence in the students' ability to succeed. Andrew said, "She knew that we [could] do it" and "she [would] demonstrate that every time."

Bethany found several aspects of her instructors' teaching quite valuable. At the beginning of the course, Bethany said that she felt calm when her instructor made it clear that if it was necessary to enroll in the class then, "we are all there because we needed extra help, but the reason behind that doesn't matter." Further, the professor referenced the need to build a

better mathematical foundation. Bethany quoted her professor, saying, “We’re gonna build a stronger foundation and be able to move on, and just work harder and you’ll get through this and everything else.” According to Bethany:

> [The instructor] was willing to help you with any homework that you had. If you didn’t understand it, you could just go and talk to [the instructor, who would then] work with you after class or whenever you could get together.

Further Bethany explained:

> I really enjoyed that class and because [the instructor] actually explained how you did it wrong, and [the instructor] showed you if you couldn’t understand it one way, [the instructor] showed you another way how to do the same problem and get the same answer.

Specifically speaking, Bethany was impressed that her instructor purposely roamed the classroom to interact individually with students while they worked. Discussing this, Bethany said:

> With [the instructor] going around and looking and helping, as you’re doing the homework, [the instructor] could look over your shoulder and . . . say, ‘Oh, I think you need to go back and look at that question,’ and that kind of signaled, ‘Oh, I think I did something wrong on that one.’

Colene discussed how impactful her remedial mathematics instructor had been on her success. Colene said, “[The instructor] was really patient and explained things well.” Colene also referenced how understanding her instructor was in providing homework schedule that made sense. According to Colene:

> [The instructor] gave out homework, but it wasn't a lot, and she made it due every other day. It was great that it was that way. It helped all of us be able to finish our work on time and efficiently.

Further, Colene believed that was a stress reliever and supported that belief by stating, "In case everybody in the class was having trouble with the certain questions, you know [the instructor] would go back over it. That was pretty helpful."

Colene also felt that her instructor created an atmosphere where she was comfortable seeking help and that the instruction was of high quality. When asked if her instructor influenced her success, Colene responded, "Yeah, definitely." She explained, "[My instructor is] really good at what [she] does." Additionally, Colene stated, "[The instructor is] very comforting and comfortable and stuff to like, go and ask questions. For me, that's one of the important things. I like, have to be comfortable to feel like I'm going to succeed in a class."

Donna emphasized the impact her instructor had on her success in the course. Donna said, "I believe that it was because of the kind of caring professor we had." She continued, "[The instructor] definitely taught me good study habits . . . the different techniques [and] the diligence of 'you have to do the homework 'cause it will help you later on, on tests and different things like that.'" Donna's instructor made it clear that if students felt confused, they must ask for help. According to Donna, "[The instructor] stressed that if you're wondering about this question, then chances are there's another person in the class that is too shy or doesn't know how to really ask the question that they're needing to ask." Because of this, Donna said she is now "more motivated to ask."

Evie's success was influenced by her instructor as well. Evie said, "I really enjoyed [my

remedial mathematics teacher]. [The instructor] was able to explain a lot of things that most teachers couldn't explain to me." Evie felt her instructor "introduced a new way of teaching." According to Evie, "There is only so much you can do for math, but there are different ways you can be creative because students learn different ways." Evie believed that her instructor was able to do this. Explaining further, Evie said, "It totally changes a student's perspective and how hard they work. And whenever I didn't understand something in the way [the instructor was] teaching, [the instructor] would introduce it to me in a different way." Furthermore, Evie felt that she was important and that her instructor truly cared about her and her success. She said:

> I think [my instructor] really saw me as a person. Whenever I needed help, [my instructor] came alongside me and didn't look down on me . . . [My instructor] wanted to come down to our level to see how we view things and to see if [he/she] could help with that.

Evie finished by saying, "[the instructor] really listened to us."

Farah's experience with her instructor was so positive that she considered mathematics as a minor. According to Farah, "I had [such] a great professor that at that moment, I thought about doing a minor in math." Further, Farah said, "I enjoyed the class; it was an entertaining class because the professor used a lot of activities to make the learning process fun and easy. It was one of my favorite classes in my first semester." Farah explained that the availability of her instructor and having the opportunity to meet when needed to address her questions contributed to her success. Farah said, "[My instructor] was open all the time. I didn't have to make an appointment." She continued, "If I had something I didn't understand, [my instructor] would say, 'No, I can explain this.' [and my instructor] would be like, 'No, this is so easy. You can do it. You are here because you are smart.'" That experience influenced Farah, and she explained that

she gained confidence in her ability to succeed. Farah stated, “I just noticed: [my instructor] is so right.”

Gretchen cited the support and instruction ability of her professor in aiding her success in her remedial mathematics course. Gretchen said, “When going to class, it was a fun environment and lots of support from my professor. [My instructor] explained the concepts and strategies really easily for [myself] and others to understand clearly.” Gretchen further acknowledged the environment created by her instructor as a reason for her success saying, “[My instructor’s] just like. real, where it makes the environment more fun . . . and cracks a couple jokes and stuff, and just makes the environment more comfortable to ask questions.”

Heather praised her remedial mathematics instructor for helping her develop an understanding of mathematics. Heather said, “My college professor really made math to where I can really understand [it] now. The methods [my instructor] shows are very helpful.” Because of this, Heather stated, “I am a lot more confident.” Heather discussed how encouraging her instructor was and the influence that had on her success in math remediation. She said, “[The instructor] really motivated us to do our homework, and even on tests, [the instructor] would come by and be like, ‘Are you sure that’s the answer?’” Heather continued, “[The instructor] would just encourage you . . . just encouraged us to do better.” Heather stated that her instructor was “available quite a bit.” Further, in class Heather’s instructor “related it to things we would understand, would use real world experiences, and would make it to where we would understand it.”

Jason believed his success was also due in part to the work of his instructor. When referencing his remedial mathematics professor, he said, “[My instructor] made math seem fun and interesting.” Further, “[My instructor] kept everyone in a good mood and taught in a fun and

interesting way." Jason continued by saying that his instructor was "always just really helpful [and] would always have us doing activities and working together." Jason also referenced how his instructor was personal in offering students help during class. Jason said, "While we were working in class, [my instructor] would come around to each one of us and look over what we were doing. [My instructor] would be very individualized about it." Jason's instructor's efforts were so influential on him, he said, "I don't know, there was this sense that I wanted to do well for her because she was helping me so much."

Kelly expressed the importance of working with her remedial mathematics professor and how it affected her success by improving her understanding. Kelly said, "Going to the professor was one of the better things I'd done while in [remedial mathematics]. She helped me understand things that weren't quite clear in my mind." Kelly said that in class, her instructor would "work through it with us over and over again until we could do it." Further, in discussing her instructor, Kelly said, "the professor was engaging, helpful, and extremely kind [and] always believed we could do it."

Exhaustion of available resources. Participants indicated the use of all available resources in their pursuit of academic success during their remedial mathematics course. These resources included: online resources, talking with peers, asking questions in class, using faculty office hours, and seeking help they would not normally pursue. Participant responses supporting this theme are discussed below.

Andrew discussed the need to seek out helpful resources. Andrew said, "It is very important to seek out different resources online, print, or even different mentors who help you to think of math in ways that you hadn't considered before. He continued, "By looking at different topics from different angles, you're able to understand in every way possible." Additionally,

Andrew "watched a lot of tutorials" and "talked to people" about math because he considered it "a conversation kind of thing" where working with others "helps a lot."

Bethany felt it was necessary to ask questions when in need. In referencing procedure Bethany stated, "Ask questions when you are unsure because if you don't know the beginning of the steps, [then] you won't get the problem right because the foundation is incorrect." However, Bethany emphasized the need to seek help from the instructor and ongoing review. She said, "If you had questions that you didn't want to ask in class, you could come afterwards and talk to [the instructor]."

According to Colene, necessary aspects to success in remediation include help-seeking behaviors. When referencing what remedial mathematics taught her, Colene said, "It's given me some pretty good ways to study or like, work hard." She continued, "Especially to do like, the study guides, go to tutoring sessions if I needed them, and ask questions." Further, Colene said, "Stuff that I didn't understand then, I would go, you know, ask for like [help], if it was really hard."

Donna referenced the need to ask questions when struggling, regardless of whether it feels uncomfortable to do so. Donna said:

> Asking people for help with a problem that you are struggling with plays a major part. Often people are too nervous to ask for help for fear that they will be seen as not being smart. But often times, other people will have the same question, and it will helpful for you in the future.

Donna highlighted this idea when discussing what she did to be successful in remedial mathematics. In referencing how she received help, Donna said, "I helped other people in the

class with their homework and stuff like that, and if I had other questions, I asked them or asked . . . or went during [the instructor's] open hours to ask questions.

Evie also referenced the need for alternative resources to be successful. Evie stated, "I did a lot of group studying when it came to [remedial mathematics] and a lot of problem solving on my own. I would Google math problems online and solve them."

Farah believed that asking questions and trying other possible methods to work through course concepts is necessary when facing academic difficulties. Farah said, "Ask questions, even when those seems to be simple. Finding other ways to solve a problem is very important because it give a new path for students to develop their math thinking and abilities." Further, Farah said, "I had a habit of going to YouTube™. I used YouTube™ because they explain how to do . . . even for using a calculator."

When enrolled in math remediation, Gretchen never hesitated to seek help when needed for her assignments. Gretchen stated, "Doing all your homework and asking questions in class with the ones you got wrong or simply do not understand" is essential to success. Further, emphasizing this point, Gretchen said, "Being comfortable to ask questions and get help when needed" is a necessary habit for success. During Gretchen's individual interview, she reiterated the importance of asking questions saying, "if you don't understand, ask questions."

Although Jason claimed to have limited need to access alternative resources, he did take the necessary steps when he had an issue with a course concept or problem. When in need, Jason would seek help from the instructor. When asked how he would seek help during tough times, Jason said he would contact the instructor "through emails." According to Jason, "I would email [the instructor] pretty often. [The instructor] was very helpful that way." Additionally, when referencing the use of office hours Jason said:

> I guess I sort of wish I did, although it, it wasn't . . . it wasn't necessary, obviously, but to go and talk to her if ever really had any problems . . . I think that, that would have been a nice [thing].

Kelly sought multiple ways to overcome academic difficulties, emphasized by seeking the help of her professor and her peers. According to Kelly:

> Going to talk to the professor when you have a problem does wonders for figuring out difficult equations and also alerts the professor to the fact that you are having trouble, so they can arrange help accordingly. Doing homework with a friend and arguing over solutions to problems, helping a friend through their homework, also helps it to settle in your brain and stay.

Although Kelly said, when asked about exhausting resources, "I don't think I exhausted them 'cause I had the Internet," which itself is a resource. She followed by saying that to succeed, "I used everything at my disposal."

Persistence. Participants credited their ability to overcome understanding of course concepts by rising to the challenge and persisting. This is evident in how they discussed the challenges in the course and those processes they used to be successful on homework and exams. By working diligently and persisting through exceptional effort, participants were able to achieve success.

Andrew, although he admits that enrollment in remediation was "scary," viewed math remediation as a challenge and compared it to a work out. According to Andrew:

> At first, it was quite scary since there is a sense of not knowing what might happen. However, once you get deeper in the different topics, it becomes more like a work out.

> Every time it's a new challenge, and it becomes more exciting because you're building upon what you already know.

Andrew solidified this comment by saying, "When you work out, you hit for a higher goal every time, and if you did the routines right, it'll be easier to think of the next level as achievable. It applies with math."

Bethany's persistence to succeed included "being able to take the time and go through and look at every question in the notes," which she said, "was really helpful [because] you're not just learning how to do it, you're learning the steps and the reason of how to do that problem." Further, Bethany said, "I went through and reviewed everything."

Colene believed that to be successful, one must believe the task can be accomplished work hard to do so. According to Colene:

> I think it is important to have the mindset that you can do it and that it can be done. Math his hard for some people (like me) and so I had to really work at it. I think when trying to be successful in [math remediation] or any other math class, it's important to do the work the same day you've had the class.

Colene also added, "Sometimes it was like pretty difficult. I'm like, 'Man, I really don't want to do this because it's math,' [but] I did it anyways." Supporting this Colene said, "I remember that there were like some nights where I would just like, you know, devote, you know, like a good couple of hours, I guess, to try to understand . . . I worked on the weekends a lot."

Donna referenced the need for personal persistence in discussing how she went about studying to gain concept understanding. According to Donna:

> One of the most important things to do in order to be successful in [math remediation] would be to write down all your steps. It is so important to show that you have done it so that later in testing, you don't skip a step and get the wrong answer.

Evie expressed the need for individuals to practice course concepts. According to Evie:

> [Practice] is extremely important because in order to have a certain concept or math formula down you have to practice. You won't get it overnight; It takes a lot of working things out and practicing problems in order to get problems down.

Evie, to overcome lack of confidence, persisted through the course even when it was difficult. Evie said, "I worked hard to be able to work out problems even more, so that I would fully understand and be confident enough." Evie justified the need to work hard by saying:

> Finally, to be able to work hard and getting an 'A,' which is what I've been trying to do for so long, when I finally pulled it off . . . all that hard work . . . it showed that I could do it, and I was able to see.

Gretchen emphasized the need to persist by treating assignments as assessments. According to Gretchen, "Making it a habit in getting your work done and thinking of your homework as a test are great strategies in succeeding in math class."

Heather's persistence to succeed was evident in what she believed is necessary to conquer remedial mathematics. First, Heather believed that one must "have a positive attitude towards what you are doing." Once this is established, persistence through practice is key. According to Heather, "For math, practice is the best habit. When I do it over and over, I understand it better each time."

Jason believed that students must seek the help of the professor to overcome academic difficulties. When asked what specific habits are necessary for success in remedial mathematics, Jason said, "Talk to the professor if you have difficulties."

Description of the Essence of the Experience

Through the process of data analysis, several themes emerged that helped address this study's research questions. A description of the essence of experiencing success in remedial mathematics, as derived from the essential themes found in data collection, is provided below. From the data provided via research question one, the emerging themes were: (a) previous math outcomes; (b) quality teaching prior to remediation; and (c) emphasis on academics by influential people. Two themes were determined through my use of research question two and included a belief in the value of remediation and in the importance of higher education. Further, three main themes were determined to exist using research question three, along with three themes found through exploration of research question four. Those themes include: (a) sense of community; (b) change in attitude; (c) motivation due to master and performance; (d) quality of the instructor; (e) exhaustion of available resources; and (f) persistence.

Participant backgrounds indicated a variety of mathematical experiences ranging between traditional classroom settings, online learning, and having been homeschooled. Regardless of the way in which they were taught prior to attending college, each participant could describe positive aspects of their previous experiences with mathematics, either due to an influential teacher or parent, or the venue from which they learned. Participants reported having been motivated to succeed in college due to prior success with math, given that it was something they viewed as "fun," having to "actually work," or created in them a strong "work ethic." Other participants indicated that their success in remedial mathematics was due to prior struggles.

Having to retake courses in high school and improving math skills built "confidence." Also, lacking "enjoyment" and even having "hate" for the mathematics provided motivation to succeed in remediation where previous outcomes were not "indicative" of their ability.

When successful in mathematics prior to college, participants felt that the instruction they received was of the highest quality. Quality teaching previously lead participants to a strong understanding, and their appreciation and respect for those instructors was obvious. Experiencing quality instruction meant that the participants felt their instructor was "willing" to work with them and "help" whenever it was needed. Participants compared the teachers that they admired to others who they believed did not care, claiming that quality instructors genuinely want to see their students succeed. Some participants mentioned the impact that instructors had by simply speaking into them confidence about their mathematical ability and how they were able to create an environment that would place students at ease. Further, other students were influenced simply by the importance that instructors placed on mathematics or the lengths to which they would go to find options for teaching course concepts.

Participants were not only influenced to succeed by quality instruction, but they were also influenced by other important people in their lives. In many cases, participants discussed how influential their parents were in instilling the value of education prior to college. Not only were participants influenced to work hard because of the importance of education prior to college, but they also learned the value of a college degree. Some participants never believed attending college was optional. Others saw college as a step in a natural progression of life. In many cases, participants wanted more from life than what they had while growing up. Education would allow them to be financially stable, avoid living paycheck to paycheck, and have a job

doing what they love. One participant was heavily influenced by a school counselor who filled the same role as the other participants' parents.

The participants' responses provided two main themes regarding the beliefs that lead them to a successful experience in remedial mathematics and helped to answer research question two. The two themes that emerged were: a) remediation is valuable, and b) higher education is important. Some participants highlighted the importance that mathematics remediation had and its effect on their success in future mathematics courses. Having remediated, participants felt more prepared for college mathematics because the material in remediation was familiar and provided them with a "refresher" before taking other math courses. Other participants discussed how remediation was valuable because it supported courses within their major such as science courses and future required business classes, allowing for a greater opportunity for success. Further, with its value, participants found that remediation was, in general, a strong foundation for mathematics. A few participants felt it supported them in "daily life" and that they would "use it daily."

Remediation was also considered to be valuable because participants found value in gaining a higher education. Higher education provided participants with the opportunity to have a "holistic" understanding of their chosen field, while creating greater opportunities for employment. Employment and a strong education lead to financial stability for each participant. Further, participants felt that a better chance for varying opportunities was created that would allow them to make a living while employed in a vocation they feel passionate about. Furthermore, due to specialized areas of study, participants' knew that employment without a college degree was not possible.

Participants were influenced by several factors, which motivated them to succeed in remedial mathematics. Research question three was answered by the three themes that emerged from the data: a) sense of community, b) change in attitude, and c) mastery/performance motivation. Participants felt at ease early in their remedial mathematics course because of the common ground they felt with their classmates. Success was influenced by the ability for participants to discuss course concepts with other students without fear of judgment or ridicule. The atmosphere was relaxed, and participants were included in peer camaraderie via humor and class participation. Participants reference this comfort saying things like, "no one is judging you" and "I felt included." Some participants referenced how they would ask questions in class, others would do the same, and in those moments it was helpful to have peers seeking clarification on topics they themselves struggled with. Others felt that common ground created a common goal to succeed in the course and help others do the same.

Participants indicated that during remediation, they were a part of a community that was supported by working with peers. That, in turn, provided them with motivation to succeed. Peer work influenced success for participants because they were able to be the strong or weak person during times of class work. Participants believed having to explain course concepts to peers motivates students to work hard to understand the concepts and solidifies their understanding of those concepts. Working with peers created an even more comfortable classroom for some participants, giving them a stronger feeling of inclusion. Further, peer interaction provided a more personal experience with learning and understanding course material.

Participants began mathematics remediation with a negative attitude toward required enrollment. Some participants felt uneasy about the course due to thoughts of inadequacy when they thought about their own skill level and how they compared to other students in the course.

Others were frustrated with the lack of credit, given the amount of work they would need to put in to be successful. Still, some participants were simply upset about their low standardized test scores, which lead to their remedial mathematics placement. Further, some participants were unhappy about placement given that their previous experience with mathematics included higher-level mathematics courses. However, soon after enrollment, participants saw remediation as an opportunity to gain better understanding of concepts that they struggled with in the past. Other participants saw remedial mathematics as an influence on their success in future classes, stating that the class was "worth it" and it was "good for me."

Participants felt two levels of motivation leading to their success: mastery of content motivated students to succeed as well, as the need to perform at a high level. Participants were heavily influenced to be successful because of how important it was for them to earn an 'A' in the course. Some feared failing, which pushed them to strive for a high grade. That fear of failure influenced them to "work hard" and "study for it." Others discussed how a high grade in remedial mathematics would affect their GPA and lead to success in their college level mathematics course. Further, once participants earned an 'A' early in the course, they were motivated to do what was necessary (study, etc.) to keep it.

Grades were not the only motivational factor for why students succeeded in remedial mathematics. Participants were also motivated to succeed because they wanted to gain a strong understanding of course concepts. The participants wanted to learn course material and better understand those concepts that they'd previously been unable to grasp. Several participants claimed that concept mastery was "essential" to their success, and the outcome of the need to have mastery was the grade earned. Some participants discussed how they were influenced to work hard in order to understand the material being taught and how that hard work lead to

mastery. Participants held an inner motivation for concept mastery and wanted to prove to themselves that they truly understood what they were doing because the skills they learned would aid them for life.

Instructor quality was a factor in how participants were able to overcome academic obstacles. In helping answer research question four, participants felt that the care and effort they received from their college professor was essential to their ability to succeed and overcome any issues they had in remedial mathematics. Participants were affected by their instructor's ability to deliver material via multiple avenues, approaching material in a way that allowed all students to understand course concepts. Some were influenced by their instructor's willingness to work excessively with the class and individually to ensure students gained understanding. It was impactful knowing the instructor truly wanted to see participants succeed and acted in a manner that supported that notion. Participants felt their journey through remediation was a group effort that included their instructor. Others were impressed with their instructor's positive attitude and their ability to "come alongside" the student to aide them as much as possible.

Exhausting all available resources was a theme that emerged when investigating research question four. Participants sought out any and all options when struggling with course concepts. Some mentioned the need to use the Internet, specifically YouTube™, to find help with certain types of problems or simply to get a better understanding of calculator usage. Participants emphasized the need to ask questions amongst peers and in class to gain clarification. Others mentioned extensive use of tutorials and practice exams to gain clarification. Participants, when in need, sought out the instructor during office hours or email to overcome obstacles they had encountered.

The study participants worked diligently to complete course work and do what was necessary to overcome academic obstacles due to personal persistence. They believed remedial mathematics was a step-by-step process that was challenging and required diligent effort to understand each concept given that each step lead to the next. The need to work through all provided practice daily and multiple times was essential to participants' success, allowing them to gain full understanding. Some participants had moments of doubt or felt that they did not want to do what was necessary to succeed, yet they devoted themselves to course work through practice and persistence. With positive and determined attitudes, participants completed work, stayed up late, and treated course work and practice problems as assessments to overcome their difficulties with course material.

Summary

Analysis of the Self-Description Questionnaire III (SDQ III), open response prompts, focus group interviews, and semi-structured, face-to-face interviews resulted in the emergence of several themes that described the experience successful remedial mathematics students have during their time in remedial mathematics. SDQ III results revealed that participants: (a) are not likely to feel inadequate because of mathematics; (b) often feel like they are good at mathematics; (c) generally feel they have intellectual curiosity; and (d) agree they have done well in previous mathematics classes. Emerging themes resulting from analysis of open response prompts, focus group interviews, and individual interviews helping to answer research questions included: (a) previous math outcomes; (b) quality teaching prior to remediation; (c) emphasis on academics by influential people; (d) belief in the value of remediation; (e) belief in the importance of higher education; (f) sense of community; (g) change in attitude; (h) motivation due to mastery and performance; (i) quality of the instructor; (j) exhaustion of available

resources; and (k) persistence. In chapter five, a discussion is provided of resulting themes, implications of those themes, recommendations for future research, and implications of these results.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Overview

The purpose of this hermeneutic phenomenological study was to describe and interpret the experience successful students had in a remedial mathematics course. The following chapter discusses the results of this study and how those results compare to previous research regarding the experience students have in remedial mathematics. A brief summary of the findings answering each research question is discussed, along with implications for both remedial mathematics students and instructors. Study limitations are listed, and recommendations for future research in remedial mathematics are provided.

Summary of Findings

Results from data analysis indicated specific ways in which remedial mathematics students experience success. Successful remedial mathematics students indicate their experience to be influenced by previous math outcomes, historical success, outcomes not indicative of their ability, and previous teachers who provided quality instruction. A belief in the value of remediation and the need to develop a strong mathematical foundation influenced their ability to succeed. Additionally, a belief in how remediation would support future courses, along with the financial stability that a college degree could provide, aided their success.

Another factor influencing successful remedial mathematics students was the sense of community felt amongst peers both in and out the classroom. Further, a change in attitude lead to success for study participants due to an appreciation they felt for the opportunity to improve their math skills. Motivationally, successful remedial mathematics students wanted to both gain a strong understanding of course concepts and earn an ‘A’ in the course.

Successful remedial mathematics students were able to overcome academic obstacles by seeking numerous resources via a high level of persistence. Academic obstacles were overcome due to quality instruction where the instructor was the first option for clarity in the course. Further, through the use of multiple resources (i.e., tutoring sessions, YouTube™) students pursued clarification and greater understanding. Successful remedial mathematics students took the actions necessary to be successful in both practice and purpose. They never settled for lack of understanding, stating a need to practice problems and concepts beyond those assigned.

Discussion

The following section is a discussion of this study's results. Findings from development of themes are considered in how they relate to this study's theoretical framework. Further, outcomes from this investigation and how they integrate with previous research are provided below.

Theoretical Framework Revisited

The following section revisits this study's theoretical framework and discusses how the results fit into each aspect of the given theories. The three theories underlying this study were: SCT (Bandura, 1986), AGT (Ames, 1992), and EVT (Wigfield & Eccles, 2000). Results from this study are framed within each theory providing how each influences remedial mathematics student success. Each theory is discussed below.

Social cognitive theory. SCT indicates that individuals are driven by both intrinsic and extrinsic motivation, yet they are also influenced by personal factors and their environment (Bandura, 1986). Each variable influences the other in determining when and why a task is performed. Further, self-efficacious beliefs and self-regulation influence an individual's persistence, task-value, and whether actions lead to success. Individual motivation is shaped by

one's environment from which they adapt their actions and determine an acceptable standard of performance (Bandura, 1986).

Results from this study support Bandura's (1986) research wherein participants' persistence towards success was influenced by prior successes and failures. For both experiences prior to remediation, self-efficacious beliefs were positively enhanced. Participants were motivated by these experiences to perform at a high level, demonstrate themselves capable, and show that past experiences were not indicative of their ability. This correlated directly with Bandura's (1986) research. SCT aligns directly, given that participants' beliefs in their capabilities influenced their level of persistence when completing remediation.

Bandura's (1986) SCT regarding an individual's environmental influence was supported by the participants' view of the community created within the remedial mathematics classroom. Further, the impact held by peers on successful remedial math students was significant in their success. Support from both their peers and their instructor were noteworthy factors in their belief that they could be successful and provided them with a support system. Participants' beliefs in their capability, the positive aspects of the learning environment, and their belief in the value of the course influenced when and why they completed it with such high success. This aligned directly with Bandura's findings (1986).

Achievement goal theory. AGT indicates that motivation is focused on individual behavior (Ames, 1992), and behaviors are viewed as specific cognitive processes from which one's achievement derives (Dweck, 1986). An individual's reason for goal attainment can differ between mastery and performance where personal beliefs, the required task, and outcomes pertaining to the task vary (Ames, 1992). Those individuals who appear motivated to learn often choose mastery (Brophy, 1983) and seek to develop a more holistic understanding of content

(Ames, 1992). Individuals with performance goals compare themselves to others and base success on minimal effort. Additionally they seek superiority to their peers while showing minimal effort when tasks become difficult (Ames, 1992). Individuals who choose performance goals often find motivation extrinsically completing a task because they seek a specific outcome positively supporting their self-worth (Ames, 1992).

Participants in this study were motivated both by the need to master content and perform at a high level. Although each person's reason for success was different, success was their focus both due to the need to understand course material and earn an 'A.' Aligning with Ames (1992), participants reported that they were motivated to learn because of intrinsic motivation, a typical aspect of one having mastery goals, and extrinsically, a typical aspect of one having performance goals. However, unlike Ames (1992) AGT, participants reported their only performance goal was high success and did not seek superiority to peers or lack intrinsic motivation. Where results did fall directly into Ames' (1992) theory was the persistence and commitment that each participant reported and the how they invested themselves in learning course content to be highly successful.

Expectancy-value theory. EVT indicates one's motivation is due to their belief in their performance on a specific task, how they value the task, and its utility (Wigfield & Eccles, 2000). Self-efficacious beliefs relate to success expectancy for both current and future success and not necessarily on the outcome. Expectation for success describes a person's belief on how they will perform regardless of the timing of the task (Eccles et al., 1983; Wigfield, 1994; Wigfield & Eccles, 2000). The beliefs utilized in EVT are efficacy expectations (Wigfield, 1994) and relate to ability beliefs, but are distinguished by their relation to future outcomes and current perceptions of competence (Wigfield & Eccles, 2000).

The other aspect of EVT is value, where motivation is influenced by how an individual values a given task (Atkinson & Feather, 1966) and is described as a subjective belief influenced by one's personal views (Eccles et al., 1983). Value is broken into four areas: utility, attainment value, intrinsic value, and cost (Wigfield & Eccles, 2000). Utility is defined as the importance a task has for a future goal (Eccles et al., 1983), where if viewed as useful, the task has utility (Agbuga, 2011). Given that the value of a task is subjective, one's perception of a task impacts academic choices (Husman et al., 2004).

Study participants reported behaviors and beliefs that aligned with Wigfield and Eccles' (2000) EVT. Participant expectation for success differed initially where self-efficacious beliefs varied. Yet because of their differing ability beliefs, each participant was motivated to succeed, and his or her expectations were high. Each successful remedial math student saw utility and value in remediation and because of this chose behaviors that supported an outcome of high success. Further, the cost attached to performing the behaviors required to be highly successful was deemed necessary and was worth the sacrifice because of the clarity gained through remediation and the attained outcome. Aligning with EVT, these individuals determined the task worth the required cost and were motivated both intrinsically and extrinsically to complete it (Wigfield & Eccles, 2000).

Discussion of Results Related to Prior Research

The following section discusses how previous research compares with the results of this study. Organized by this study's research questions, this discussion aligns results of other research within the themes discovered through analysis of this study's collected data. Results help to begin filling the gap in remedial mathematics research by giving successful remedial mathematics students voice regarding their course experience.

Research question one. Using research question one, I asked participants what experiences influence remedial math students' success. Results indicated a successful experience is influenced by: (a) previous math outcomes, (b) quality teaching prior to remediation, and (c) an emphasis placed on academics by a person of influence.

Previous math outcomes. Participants who reported success prior to remediation clearly believed that they would be successful and perform at a high level in math remediation. Those who had experienced difficulty were motivated to perform well because prior results did not represent their ability. Aligning directly with Benken et al. (2015), each participant believed in their ability to succeed regardless of their past. Like prior studies (Benken et al., 2015; Bulut et al., 2007; Gilbert et al., 2014), participants' success was influenced by belief in their ability to succeed. Similar experiences have been reported in prior studies where remediation was required for students who reported a historical disconnect with mathematics (Canfield, 2014; Duranczyk, 2007). However, unlike Edward's (2010) study, successful students in this study did not report a disconnect with math due to being overwhelmed, lacking confidence, or frustration with the subject. In contrast, successful students who struggled previously reported a dislike for the subject as the main reason for their math disconnect. Further, participants who claimed to historically struggle with math did not report a poor attitude, but rather, a high level of motivation (Howard, 2008; Howard & Whitaker, 2011).

Frustration existed for successful students when required to remediate, causing feelings of embarrassment and stigma. These same expressed feelings were previously reported by unsuccessful students (Cordes, 2014). Because of their history with math, participants in this study who reported no historical struggle with the subject reported feelings of awkwardness around peers, frustration with having to re-learn material, and frustration with enrolling in a non-

credit bearing course. This was similar to the results of Novac (2016). This study's participants who did historically struggle with math reported higher levels of embarrassment, and their math perception was negatively impacted. This was a common outcome found in prior research (Cordes, 2014; Novac, 2016). However, those who struggled prior to remediation were able to achieve success similar to the results of Howard (2008) and Howard and Whitaker (2011). Yet, participants did not feel helpless in math (Howard, 2008; Howard & Whitaker, 2011), nor were they negative because of their attitude, emotions, or math self-concept (Cordes, 2014; Novac, 2016).

This study's participants approached remediation with a growth mindset, unlike the results found by Cordes (2014). Students who previously experienced success and failure displayed a growth mindset given that they believed they could learn and succeed at a high level. Participants' positive self-efficacious beliefs positively influenced their math self-concept similar to the results of Neipel et al. (2014). Similar to the findings of Nasiriyan et al. (2011), self-efficacious beliefs had a direct impact on achievement during participants' time in math remediation, yet the impact of self-efficacy was found by Novac (2016) to impact success due to delay in enrollment.

Quality of prior teachers. Participants in this study reported a positive impact on their success by teachers with whom they interacted prior to college, emphasizing the importance of quality teaching and the support those instructors provided. This is in contrast to the findings of prior studies where participants reported an inability to achieve success due to the lack of prior quality teaching (Cordes, 2014; Howard, 2008; Howard & Whitaker, 2011; Mathai, 2014). Negative experiences were due to a lack of personal touch (Howard, 2008; Howard & Whitaker, 2011), poor experiences enhancing a fear of learning math (Mathai, 2014), and a confirmation of

math inadequacy (Cordes, 2014). However, both Cordes (2014) and Mathai (2014) reported examples where quality teaching aided participants in math comprehension prior to college.

Emphasis on academics by influential people. Participants in this study developed an understanding of education and its importance because of influential people in their lives. Yet in other studies, unsuccessful students lacked positive influence from their parents (Howard, 2008; Howard & Whitaker, 2011; Mathai, 2014) and felt teachers only had a negative impact on their academics (Howard, 2008; Howard & Whitaker, 2011). This indicated that parents, teachers, and school counselors are significant factors regarding a student's success in math remediation. This was further supported by Novac (2016) where influential people positively impacted participant's math self-concept and perception of mathematics. However, in that same study, findings indicated that influential people can have a negative impact as well (Novac, 2016).

Research question two. Using research question two, I asked participants what beliefs influenced them to succeed in math remediation. Study results indicated that success in remediation is influenced by an individual's value belief regarding mathematics and their belief in the importance of higher education.

Higher education is important. Successful remedial mathematics students participating in this study reported a belief in the importance of higher education. Unlike the findings of Mathai (2014), successful students are motivated by their family backgrounds and are able to overcome the negative effects because they see a need for education, have experienced a lack of financial security, and recognize the importance of a college degree in obtaining gaining employment. Similar to those students in Cordes' (2014) and Mathai's (2014) studies, participants in this study exemplified a high level of commitment to earning a college degree. Study results indicated that successful remedial math students believe higher education is

necessary and provides a path to long-term goals aligning with previous studies (Howard, 2008; Howard & Whitaker, 2011; Koch et al., 2012).

Remediation is valuable. Study participants reported finding value in having to remediate. Like Hammerman and Goldberg (2003), study participants viewed remediation as a path towards future college success. This was emphasized by the importance of the foundational aspects of the course discussed by participants and its impact on subsequent courses. This same finding was discussed in prior research where, even though they were unsuccessful, participants held the same belief (Cordes, 2014). However, Novac (2016) found it was necessary to clearly define the need for math remediation given that participants found no utility for the course.

As study participants experienced success, their ability beliefs increased. According to Benken et al. (2015), this is an expected part of the experience for successful students. Additionally, this study found that participants experienced enjoyment, confidence, and comfort similar to those participants in Benken et al. (2015).

Participants deemed remediation to be valuable and it is inferred that placement was considered appropriate. This is supported by similar findings in Kim et al. (2014) where required remediation lead to high levels of self-regulation, leading to high success for participants. Further, several other studies have drawn the same conclusion regarding course placement (Canfield, 2013; Cordes, 2014; Goeller, 2013; Howard, 2008; Howard & Whitaker, 2011).

Value for the course was influenced by how participants viewed the utility and eventual attainment they would gain for having completed it. This is similar to other remedial mathematics studies (Berger & Karabenick, 2011; Phan, 2014). However, results differed from Berger and Karabenick (2011), as this study's participants held great value for remediation.

Further, this study's results were in contrast to Novac's (2016) findings because participants saw no utility for remediation because its value and need was unclear.

Research question three. I used research question three to ask what factors motivated remedial math students to succeed. Analysis of participant data found that the factors motivating remedial math students were: (a) a sense of community, (b) a change in attitude, and (c) mastery or performance goals.

Sense of community. Classroom environment played a significant role in each participant's success during remediation and has shown to be a significant influence on student math perceptions (Novac, 2016). Like several prior studies, participants felt that they were influenced by both their peers and their instructor (Guy et al., 2015; Leong & Alexander, 2014; Novac, 2016; Penny & White, 1998; Wolfle, 2012). Furthermore, classroom environment has been identified to have a significant impact on remedial math students in other studies (Canfield, 2013; Cordes, 2014; Edwards, 2010; Howard, 2008; Howard & Whitaker, 2011; Novac, 2016). Successful students reported how impactful a positive classroom environment was because they felt comfortable asking questions, which aligns with previous research (Koch et al., 2012). Similar to the findings of Cordes (2014), participants' confidence was boosted when they were able to ask questions in class and contact the instructor during office hours. This, in turn, increased the positive classroom atmosphere.

Previous research indicates a significant influence held by peers in a remedial math classroom (Edwards, 2010) and how that peer influence can have both a positive and negative impact (Novac, 2016). Peers held a positive influence on this study's participants because working alongside classmates aided their success through greater understanding of course content. In contrast to Cordes (2014), peer comparison did not hinder success, but was a driving

factor in achieving success. Further, in both Cordes' (2014) and Mathai (2014) studies, findings indicated that students failed to seek out peers for clarification and build stronger understanding of course concepts. Therefore, this study, emphasized the importance of peer interaction and the need for students to seek others when in need.

Change in attitude. Participants' attitudes towards remedial placement were similar to recent research (Cordes, 2014; Koch et al., 2012; Novac, 2016; Mathai, 2014). Successful students had a negative reaction to placement (Cordes, 2014), but did not blame their high school education or incompetent teachers (Koch et al., 2012; Mathai, 2014). However, successful students focused on low standardized test scores like the results reported by Cordes (2014). Similar to the findings of Mathai (2014), this study's participants had a change in attitude when they began to see remediation as a stepping-stone to future math success. This attitude change was also due, in part, to early success, which provided the participants with renewed confidence in their mathematics ability. This confirmed the findings of other studies (Cordes, 2014; Howard, 2008; Howard & Whitaker, 2011; Koch et al., 2012).

Mastery or performance goals. Participants in this study reported high levels of motivation as determined by several previous studies (Benken et al., 2015; Guy et al., 2015; Leong & Alexander, 2014; Penny & White, 1998; Wolfle, 2012). Further, like the participants in Wadsworth's (2007) study, successful students exhibited characteristics of concentration and information processing. This study's results indicated that participant motivation is an essential aspect of remedial math success, similar to the findings of Canfield (2013), Howard (2008), and Howard and Whitaker (2011).

Participant motivation influenced by mastery goals aligns with what has been reported by several other studies (Keys et al., 2012; Nasiriya et al., 2011; Phan, 2014; Raccanello &

Bernardie, 2013). Participants exhibited signs of intrinsic motivation explained partially by the learning environment. Aldhafri and Alrajhi (2014) found a moderate relationship between teaching styles and intrinsic motivation, but reports from this study's participants indicated this to be significant relationship. This correlated directly to the findings of Gilbert et al. (2014). However, in contrast to the findings of this study, neither Bulut et al. (2007) nor Gilbert et al. (2014) reported a significant relationship between academic achievements in math when dependent on intrinsic motivation or mastery goals. Further, Schweinle and Helmings' (2011) study found that few students indicated mastery goals as motivation for their success in mathematics, which opposes the findings of this study where mastery was a significant factor to participant success.

Results from this study indicated that performance goals positively influenced remedial mathematics success. Unlike the results of prior research (Gilbert et al., 2014; Nasiriyan et al., 2011), performance goals were highly motivating and pushed students to work hard, self-regulate, and persist. Further, where Keys et al. (2012) found no significant effect on mathematics achievement by those who indicated performance goals as a motivator, this study made clear that performance had a major impact on participants. Schweinle and Helming (2011) reported similar results to this study, but participants indicated that performance was the main reason for success, and mastery was not significant. Further, the findings of this study were similar to Neipel et al. (2014) where performance related to academic self-concept.

Research question four. The purpose for research question four was to determine how successful remedial math students overcame academic obstacles. Study results indicate that participants overcame academic obstacles due to: (a) quality instruction, (b) exhaustion of available resources, and (c) persistence.

Quality of the instructor. Similar to prior research, participants reported that their instructors had a significant impact on their individual success (Canfield, 2013; Cordes, 2014; Edwards, 2010; Howard, 2008; Howard & Whitaker, 2011; Novac, 2016). Like those students in the studies performed by Edwards (2010), Howard (2008), and Howard and Whitaker (2011), successful students in this study indicated that a caring instructor was integral to achieving high success. Further, other studies' findings aligned with results in that successful students reported an increase in math self-efficacy due to encouragement received from their instructors (Canfield, 2013; Novac, 2016). Study results emphasized that the importance of positive interaction with remedial math instructors correlates to the findings of previous research where a teacher's personality, enjoyment of teaching, relationship building, and belief in student ability promotes success (Cordes, 2014; Guy et al, 2015; Leong & Alexander, 2014; Novac, 2016; Penny & White, 1998; Wolfle, 2012). Additionally, Mireles et al. (2011) found that other characteristics of remedial math instructors such as available office hours, personal support, and differing approaches to course concepts led to students' ability to overcome academic adversity. This was similar to the reports of the participants in this study.

Exhaustion of available resources. Results from this study indicated that successful remedial mathematics students seek out and use any and all resources available to them to be successful. Like those students in the study conducted by Potacco et al. (2008), successful students used online options to help them develop better understanding of course concepts. Specifically, students in this study mentioned the use of YouTube™ like those students in Howard (2008) and Howard and Whitaker (2011), when in fact the students in Potacco et al. (2008) completed specific online supplements. Further, the use of online resources had an

impact on the success of the participants in this study and have shown to be key components in student success in prior research as well (Koch et al., 2012).

Successful remedial mathematics students in this study made regular use of campus resources, similar to those participants in Howard (2008), Howard and Whitaker (2011), and Koch et al. (2012). Participants sought out help via class tutoring, peer work, instructor office hours, email, and campus learning centers. It is evident from prior research that the efforts of the students in this study are a common practice to achieve success in remedial mathematics (Canfield, 2013; Edwards, 2010).

Persistence. Successful remedial mathematics students in this study made remediation a priority and found success through persistence. Through affective behaviors like class participation, attendance, and regular homework completion, the study participants increased their mathematics knowledge and achieved success. These affective behaviors are the same as those exemplified in the research performed by Li et al. (2015). Therefore, similar to Edwards' (2010), the results of this study indicated that due to both mastery and performance goals, participants were motivated to put into practice the above-mentioned affective behaviors to gain success.

Participants indicated the importance of homework completion prior to quizzes and assessments. Further, although Mireles et al. (2013) specifically reported on preparation homework, the results showed a positive impact on grades and a better preparation for upcoming class periods. Further, participant behaviors such as hard work and effort were evident, aligning with the reports of Duranczyk (2007) and Edwards (2010). Like those students in Canfield's (2013) study, participants made it clear that appropriate effort was required to succeed. Therefore, given that effort was important, it was found not only in homework completion (Koch

et al., 2013; Howard, 2008; Howard & Whitaker, 2011), but also in practice problems, assessment reviews, and time committed to the course (Canfield, 2013).

Implications

The following section discusses the implications of this research, organized by the themes determined via analysis. Each section discusses how the resulting themes impact specific areas of a remedial mathematics student's experience whether before or during their remedial mathematics course. Steps that can be taken to help aid in successful completion of mathematics remediation, based on the research results, are discussed.

Previous Math Outcomes

Previous math outcomes indicate students are influenced by prior success and struggle. Success is possible even when previously there had been failures. Students who struggled prior to remediation must focus on developing grit and persist to be successful like those students in Howard's (2008) study. Instructors must help low-performing students develop the grit necessary to improve their performance, showing them the benefits of persistence and hard work. For those who were previously successful, their focus must be on prior successes and viewing failure as an opportunity to improve via a growth mindset (Cordes, 2014). Therefore, remedial mathematics success can happen because motivation can develop from positive self-efficacy built from prior successes, which will in turn, lead to improved academic outcomes.

Quality of Prior Teachers

Student success in remedial mathematics is influenced by previous experiences with teachers. Prior instruction is important to student self-concept and math self-efficacy. Quality instruction is a factor both prior to remediation and during and is one of the many factors influencing student success (Bandura, 1986). Therefore, pre-college instruction must focus on

providing students with a genuine belief that their teachers want them to succeed and believe that they can do so through unlimited support and approachability. These approaches must be deliberate and provide students with confidence. If not, students will recognize the lack in care and belief, leading to poor motivation and low self-efficacious beliefs.

Emphasis on Academics by Influential People

Parents, teachers, and counselors play a major role in the success of remedial mathematics students. Parents must strive to instill the importance of education in their children, aiding them in developing their motivation to learn. By using their own personal experiences and socioeconomic situations, parents can impact their child's belief in the value of education. School counselors can have a significant impact on the students with whom they interact. A focus on academics is important, but they must also show a holistic concern for the student and instill belief in their academic ability.

Higher Education is Important

Due to the importance that successful remedial mathematics students place on higher education, influential individuals must speak into the importance of education and its impact on remedial mathematics students and their future goals. Further, the implications of higher education on future finances, job opportunities, and basic human needs must be a part of an ongoing dialogue with these students. By fostering a need to learn, teachers can develop an educational environment that informs students of the vast opportunities afforded an educated person. These actions by educators, counselors, and parents will help to convey education as a key aspect for future employment and success.

Remediation is Valuable

Given that successful remedial mathematics students believe in the value of remediation, fostering these beliefs is a necessity. Specifically, instructors should target those students who are performing at low levels, showing lack of interest, and failing to find relevance in the need to remediate. By creating an atmosphere of value for remediation, student motivation can be promoted. Instructors must focus on both the utility of the course and its foundational aspects, and instill within their students the notion that the time and effort needed to succeed is worthwhile. Having the greatest influence on these students, faculty can impact student success in both college level math classes and other future courses. Value can be fostered in remediation when faculty exercise excellent preparation, strong instruction, and an ongoing discussion of the importance of mathematics.

Sense of Community

Given the importance of community for success in mathematics remediation, fostering an environment where students support students and remediation is not viewed as a weakness, but as an opportunity. Cordes (2014) found that low-performing students tend to isolate themselves during remediation. Therefore, the instructors must work to create a community of learners that includes this population, given that it benefits the students' comfort, understanding, and self-concept. Through the creation of a comfortable atmosphere, the stigma of remediation can be lifted. An inclusive environment, where seeking help is encouraged, is a necessity for remedial mathematics success. Therefore, students must have the opportunity to work together, help each other understand difficult concepts, and solidify individual understanding. Through this type of environment, academic relationships can be built, fostering a free flow of ideas and helping lead to greater success.

Change in Attitude

Remedial success is more likely when students value the experience. It is imperative that faculty focus on the importance of remediation and the opportunity it provides students to gain a greater understanding of course concepts that they previously struggled to understand. Low-performing students need to experience success, which when experienced early (as shown in the results of this study), helps students to see that they can be successful and creates a positive mindset, thereby changing the attitude of the student. In an effort to make this happen, instructors should find ways in which early success can be had by all. When students begin to believe in the value of mathematics remediation, their attitudes move from frustration to gratitude. This approach by faculty can help students recognize the opportunity they have to increase their understanding and set themselves up for future success.

Motivation Due to Mastery and Performance

Successful remedial mathematics students are motivated to succeed both due to a need to gain a strong understanding of course concepts and because they want to earn an 'A.' Therefore, it is critical that students seek to develop an intrinsic motivation where a strong understanding of course material is essential to success. This should be emphasized by faculty that can impact students' holistic understanding and discuss how this approach can correlate directly to high success. By partnering these two concepts, students and faculty can appeal to both the intrinsic and extrinsic motivation for successful remediation. When focusing on concept mastery, faculty can promote both greater understanding as well as the desired outcome of earning an 'A.'

Quality of the Instructor

Successful students need instructors who have not only mastered their craft, but also care about their students' success. Faculty can positively impact student success by continual

evaluation of their pedagogical approaches both as a whole and with individualized concepts. Personal reflection on lessons, units, and entire semesters can lead to improved student outcomes. Faculty must take steps that clearly indicate to students that they truly care about their success by being present, available, and patient. This is especially necessary for low-performing students. Through the actions of the instructor, showing students they truly believe in their ability to succeed, low-performing students can move from a fixed to a growth mindset. The encouragement from the instructor, actions that reflect they care about their students' success, and a focus on improved instructional techniques targeting low-performing students can provide a venue for success.

Exhaustion of Available Resources

For students to remediate successfully, they must seek out and find any and all available academic resources on campus and online. Universities and mathematics faculty should provide students with a variety of supports ranging from one-on-one help to available faculty office hours. A concerted effort by faculty to instill in low-performing students the benefits of using help-seeking behaviors can promote the use of campus resources such as math labs and tutoring centers. Further, suggesting the use of Internet resources such as YouTube™ and emphasis on peer work inside and outside of class can promote readily available resources. Additionally, providing extra university funding to academic services allows for the hiring of supplemental instructors, tutors, and math lab employees. Finally, providing students with online supplements such as concept tutorials or individualized programming to meet student needs can further support student success. When these resources are put into place and faculty are involved, an understanding of their importance is developed.

Persistence

Persistence is a key variable relating to success in remedial mathematics. Therefore, students must commit themselves to activities that are necessary to be successful. When concepts get difficult, student effort must be continuous with ongoing practice while seeking all available resources. Students who recognize that success is earned through effort must also understand that effort must always be at its highest level. Remedial mathematics students must be motivated towards a greater understanding of course concepts through diligent approaches to course requirements and a refusal to give up through a growth mindset. With the support of faculty, students can see failure and struggle as an opportunity to improve their understanding, which will lead to success.

Delimitations and Limitations

For the purposes of this study, participants were recruited who had earned at least an 'A' in the highest level of mathematics remediation, having only taken the course one time and with no previous mathematics remediation in higher education. Because of this delimit, limits to this study existed. Through the recruitment process, females were more interested in the study. This limited the number of male participants. Therefore, a more diverse group in terms of gender would have most likely provided a more robust and transferable set of themes. Secondly, this study was limited to participants from one institution. The institution was chosen due to my background and experience with four-year private institutions and could limit the scope and richness of the findings from the participant pool. Another limitation is the delivery method, which was traditional, at the research site. Further, each participant at the research site was taught by the same individual. Given that participants all received instruction from the same person, outcomes of this study may be limited to the instructor, and outcomes may have been

different had the course been taught by someone else. Therefore, outcomes of this study may not be as robust, nor as generalizable, as they could have been had a variety of instructors taught the course. Transferability to other, similar institutions may be limited with the various ways in which mathematics remediation is taught. Further, a developmental sequence was not offered at the research site, meaning that the participants in this study may have tested into a lower course at another institution, providing them with a completely different experience. Finally, although many of the participants were able to recollect the experience they had in mathematics remediation, the time elapsed from their experience may have hindered the richness of their responses to interview questions.

Recommendations for Future Research

Continued research regarding the success of remedial mathematics students is a necessary query. Literature regarding remedial mathematics students' experience with remediation is lacking, and when it exists, typically focuses on students' failures and not their successes. Therefore, it is clear that more research is necessary to gain a stronger understanding of the experience that successful students have in mathematics remediation. It would be beneficial to conduct a similar study involving this same population of students at multiple institutions of different sizes, both public and private. Further, given the results of this research, a future study with this same population that quantitatively assesses their achievement goal orientation would help to either refute or corroborate the results of this study. This type of study could also be implemented across all sizes and types of higher education institutions. Lastly, a quantitative study regarding how participants' expectancy and value of mathematics remediation correlates to their earned outcome across multiple institutions of types and sizes would help to again refute or corroborate the results of this study.

As I conducted this research and analyzed the resulting data, several questions developed. The following set of questions are necessary inquiries for future research with successful remedial mathematics students.

1. What motivates remedial mathematics students to succeed when required to complete a sequence of developmental courses?
2. What is the experience of successful remedial mathematics students who enroll and successfully complete the subsequent college-level mathematics course? Does remedial success predict future mathematics success?
3. How do successful remedial mathematics students overcome academic struggles in their college-level mathematics course?
4. How do male students experience success in remedial mathematics?
5. What is it like to experience success in non-traditionally remedial mathematics course? What is it like to experience success in an online, flipped, or emporium model of remediation?
6. How important is the relationship successful remedial mathematics students have with their instructor?

Summary

By framing my research within the theories of Bandura (1986), Ames (1992), and Wigfield and Eccles (2000), this study's purpose was to describe and interpret the experience had by successful remedial mathematics students. Themes determined via self-reported participant data included: (a) previous math outcomes; (b) quality teaching prior to remediation; (c) emphasis on academics by influential people; (d) belief in the value of remediation; (e) belief in the importance of higher education; (f) sense of community; (g) change in attitude; (h)

motivation due to mastery and performance; (i) quality of instructor; (j) exhaustion of available resources; and (k) persistence.

Given my teaching history as an instructor of mathematics remediation, the results of this study were both expected and unexpected. It was expected that highly successful remedial math students would be highly motivated, persistent, and use all available resources at their disposal. What I did not expect was a unanimous need to both master course content, because of its value and foundational aspects, and the need to pass the class with an 'A.' Of course, given my anecdotal knowledge of successful remedial math students, I expected students who sought strong understanding to earn an 'A' because it would naturally happen with this type of focus on course content. Yet, it was also very motivational for participants to earn a tangible reward. They wanted to see an 'A' on their transcript. Further, once they had an 'A,' they were bent on keeping it.

As I analyzed data and listened to participants' stories, it became clear that multiple variables affect student motivation in a remedial math class. The classroom community was extremely important. Participants felt comfortable not only with the instructor, but also with their peers. Most importantly, the instructor played a significant role in each participant's success. Cordes (2014) discussed the influence that an instructor has on a student, and this is very obviously present in the results of this study. One of the most important aspects successful remedial math students experience was the many supportive characteristics of their instructor.

Because the instructor plays such an important role in remedial student success, faculty should be striving to support their students' self-efficacious beliefs and speak into their ability to succeed. By projecting a belief in student ability, faculty can create an environment where students begin to believe they can learn course content. Further, through ongoing

communication, faculty can develop the importance of remediation, its ability to set students up for success in future courses, and how foundational remedial course content is for their success by emphasizing its utility for their future.

I believe that this study is just the beginning in the investigation of successful remedial mathematics students. Regardless of the venue, successful experiences of remedial mathematics students must be further explored to continue improving faculty approaches and future course designs. Given the results of this study, the venue through which remediation is taken may not matter. What does matter is that students are being positively spoken into about their mathematics ability and that those who teach the course create an environment where a community of learners is working together to meet a common goal: success. Promotion of campus resources, multiple options for practice of course concepts, and maximum availability of the instructor can lead to high success for students. Through the use of a variety of quality instruction and peer interaction, remedial mathematics instructors can begin to develop an environment where students are motivated to master course content because of its value and relevance, all while earning a tangible reward.

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Appendix A: IRB Approval Letter

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

September 30, 2016

Kyle J. Ireland
IRB Approval 2633.093016: Defining Success: A Hermeneutic Phenomenology of Successful Remedial Mathematics Students

Dear Kyle J. Ireland,

We are pleased to inform you that your study has been approved by the Liberty IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

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Appendix B: First Email to Participants

First Email to Participants

Dear Student:

I am conducting research as partial requirement for a doctoral degree in educational leadership at Liberty University. I am contacting you today inviting you to participate in my research study. In order to participate in this study, you must have passed Intermediate Algebra (MTH 0153) at John Brown University and earned an 'A-' or higher (or a percentage of 90% or higher) without any prior remedial mathematics courses. In order to verify that you meet this study's requirements, a confirmation of grade received in Intermediate Algebra (MTH 0153) will be requested, in addition to information confirming that you have taken no prior mathematics remediation. If you choose to participate, I will ask you to provide me with permission, via your signature, to verify your Intermediate Algebra grade with John Brown University and prior post-secondary mathematical history. The deadline to participate in this study is October 31, 2016. Those who choose to participate will be asked to complete an online demographic survey, complete open response prompts, participate in an audio-recorded focus group interview, participate in an audio-recorded individual interview, and an audio-recorded follow-up individual interview. Although your name will be requested in order to participate, your participation will be confidential. Each participant will receive a $10 Amazon.com or local coffee shop gift card.

In order to participate, please click on the link below to read and sign the informed consent document. This document contains additional information about my research study. By submitting the informed consent document, you are voluntarily agreeing to participate in my study. Once submitted, I will receive the document and provide you with directions for

completion of the demographic survey, Self-Description Questionnaire III items, and open response prompts. Further, I will contact you in order to begin scheduling focus group interviews.

https://goo.gl/forms/DU5OSbj1Ckn2v0kT2

Appendix C: Informed Consent

The Liberty University Institutional
Review Board has approved
this document for use from
9/30/2016 to 9/29/2017
Protocol # 2633.093016

Informed Consent

Experiencing Success: A Hermeneutic Phenomenology of Successful Remedial Mathematics Students

You have been invited to participate in a research study exploring the experiences of remedial mathematics students. You have been identified as a possible participant because you recently earned at least an A- (or a 90% or higher) in Intermediate Algebra on your first attempt at John Brown University.

By signing this informed consent document you are agreeing to voluntarily participate in this study. I, Kyle Ireland, a doctoral candidate at Liberty University, will be conducting the research. Please contact me at kireland3@liberty.edu if you have any questions or concerns.

The purpose of this study is to describe how students experience success in a remedial mathematics course. Your participation is voluntary and will have no influence on your relationship with myself, Liberty University or John Brown University. All participants who complete the study will receive a $10 gift card to Amazon.com or a favorite local coffee shop. Further, each participant with have the chance to win a $100 amazon.com gift card. The winner of the $100 amazon.com gift card will be chosen at random following the completion of the study.

Withdrawing from the Study. Because participation is voluntary, you may withdraw from the study at any time, without penalty, by contacting me at kireland3@liberty.edu. All data pertaining to withdrawn participants will be destroyed with the exception of focus group data. However, all individual responses given by withdrawn participants will be excluded from the study. Further, confidentiality of focus group responses cannot be guaranteed. The only

foreseeable risk to participants is breach of confidentiality if data form the study is lost or stolen. However, benefits from this study may affect future remedial mathematics students in the areas of instructional practices and student success strategies. Your identity will remain confidential in order to protect your identity by being provided with a pseudonym. All digital documents will be stored in a password-protected folder on my computer, and all hard copies of documents will be stored in a locked cabinet in my office. All documents will be destroyed or deleted after a period of three years following the completion of the study.

Your Participation. After you have signed informed consent, you will receive an email from me including a link to a demographic survey, which includes a mathematics and problem solving portion of the Self Description Questionnaire III and three open response prompts. The demographic survey and Self Description Questionnaire III items with the three open response prompts should take no more than 30 minutes to complete. Next, you will receive an email scheduling a focus group interview. Focus group interviews will be audio recorded and expected to last 45 minutes. Then, you will receive an email scheduling the first individual interview. The first individual interview will be audio recorded and expected to last 45 minutes. Finally, you will receive an email scheduling a follow-up individual interview. The follow-up individual interview will also be audio recorded and expected to last 45 minutes. Data collection is expected to continue throughout the fall of 2016 academic semester with the follow-up interview taking place early in the spring 2017 academic semester.

I have read and understand the description of the study and contents of this document. I have had an opportunity to ask questions and have all my questions answered. I hereby acknowledge the

above and give my voluntary consent for participation in this study. I understand that I must be 18 years or older to sign this informed consent and participate in this study. I understand that should I have questions about this research and its conduct, I should contact the researcher listed above. If I have questions about rights or this form, I should contact the Institutional Review Board, 1971 University Blvd., Green Hall Suite 1887, Lynchburg, VA 24515 or email at irb@liberty.edu. I may also contact Dr. Curtis Cunningham, Human Subjects Committee chair, Education Department, John Brown University, 2000 West University St., Siloam Springs, AR, 72761, via email at irb@jbu.edu or by phone at 479-524-7318. Further, I may contact the researcher's faculty adviser, Dr. Jennifer Courduff, via email at jlcourduff@liberty.edu or by phone at 909-702-6461.

By clicking yes below I agree to participate in this study, and give the researcher permission to verify my grade. I consent to be audio-recorded during the procedures listed above and agree to provide the researcher with my signature prior to focus group interviews as confirmation of my consent.

Name (Print): _____ Date: _____

Name (Signature): _____

Email Address: _____

Phone Number: _____

Best days/times to schedule a focus group interview _____

YES

Appendix D: Second Email to Participants

Second Email to Participants

Dear Participant,

Thank you for agreeing to participate in my study regarding the description and interpretation of experiencing success in Intermediate Algebra. The next portion of this study includes the completion of demographic survey and three open response prompts, which will begin the process of describing and interpreting your successful experience.

Please click on the link below to complete a demographic survey that includes questions regarding mathematics, problem solving, and three open response prompts discussing your experience in Intermediate Algebra. Focus group interviews will soon be scheduled with participants if they have not already been scheduled.

https://goo.gl/forms/9O7Hs15mkyOD6r5E2

Appendix E: Demographic Survey

Demographic Survey

Question	Rationale	Prior Research	Research Questions	Theoretical Framework
What is your gender? *Male* *Female*	Purposeful sampling Data triangulation	Canfiled (2013) Cordes (2014) Howard (2008) Howard & Whitaker (2011)	RQ1	Bandura (1986)
What is your age? *18-21* *22-25* *26-29* *30-33* *34-37* *Over 37*	Purposeful sampling Data triangulation	Canfield (2013) Cordes (2014) Howard (2008) Howard & Whitaker (2011)	RQ1	Bandura (1986)
What is your ethnicity? *African American* *Asian* *Caucasian* *Pacific Islander* *Hispanic* *Other* *If you answered "other" for ethnicity please describe your ethnicity here.*	Purposeful sampling Data triangulation		RQ1	Bandura (1986)
What is your classification in college? *Freshman* *Sophomore* *Junior* *Senior*	Purposeful sampling Data triangulation	Canfield (2013) Cordes (2014)	RQ1	Bandura (1986)
What is your major?	Purposeful sampling Data triangulation	Canfield (2013) Cordes (2014)	RQ1	Bandura (1986)
Are you a full-time or part-time student?	Purposeful sampling Data triangulation	Canfield (2013) Cordes (2014)	RQ1	Bandura (1986)
Are you employed? *Yes* *No*	Purposeful sampling Data collection	Canfield (2013) Cordes (2014)	RQ1	Bandura (1986)
If yes, how many hours a week do you work?	Purposeful sampling Data collection	Canfield (2013) Cordes (2014)	RQ1	Bandura (1986)
What is the highest level of math you completed prior to attending college? *Algebra I* *Algebra II* *Geometry* *Trigonometry*	Purposeful sampling Data collection	Canfield (2013) Cordes (2014) Howard (2008) Howard & Whitaker (2011)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)

Pre-Calculus *Calculus* *Other*				
When did you take your highest level of of math prior to college? *Middle school* *9th grade* *10th grade* *11th grade* *12th grade*	Purposeful sampling Data collection	Canfield (2013) Cordes (2014) Howard (2008)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)

Appendix F: Open Response Prompts

Open Response Prompts

Standardized Open-Ended Prompts

Influential Mathematical Experiences

1. Describe some specific events, actions, or experiences, past or present, that helped lead to your success, indicated your ability to succeed, or summed up your successful experience in Intermediate Algebra.

Actions Required to Have a Successful Experience

2. Describe/discuss the importance of specific habits, actions, or thoughts that are necessary for students to be successful in Intermediate Algebra.

In Course Experience

3. Describe how the experience in Intermediate Algebra felt. What was you mindset knowing you were required to take it? How did you feel when you attended class? What was the environment like? How did you view your peers? How did they view you?

Appendix G: Participant Ineligibility Email

Participant Ineligibility Email

Dear Student:

As part of my research protocol, I checked with the registrar's office to confirm participant grades and postsecondary mathematics history. Unfortunately, you do not meet both criterion to participate in this study. Any and all data pertaining to you that may have been collected will be destroyed (i.e., deleted or shredded).

I truly appreciate your willingness to participate.

Kind regards,

Kyle Ireland

Doctoral Candidate

Liberty University

Appendix H: First Email to Participants with Updated Incentive

First Email to Participants with Updated Incentive

Dear Student:

I am conducting research as partial requirement for a doctoral degree in educational leadership at Liberty University. I am contacting you today inviting you to participate in my research study. In order to participate in this study, you must have passed Intermediate Algebra (MATH 0153) at John Brown University and earned an 'A-' or higher (or a percentage of 90% or higher) without any prior remedial mathematics courses. In order to verify that you meet this study's requirements, a confirmation of grade received in Intermediate Algebra (MATH 0153) will be requested, in addition to information confirming you have taken no prior mathematics remediation.

If you choose to participate, I will ask you to provide me with permission, via your signature, to verify your Intermediate Algebra grade with John Brown University and prior post-secondary mathematical history. The deadline to participate in this study is January 1, 2017. Those who choose to participate will be asked to complete an online demographic survey, complete open response prompts, participate in an audio-recorded focus group interview, participate in an audio-recorded individual interview, and an audio-recorded follow-up individual interview. Although your name will be requested in order to participate, your participation will be confidential. Each participant will receive a $10 Amazon.com or local coffee shop gift card. Further, each participant with have the chance to win a $100 Amazon.com gift card. The winner of the $100 amazon.com gift card will be chosen at random following the completion of the study.

In order to participate, please click on the link below to read and sign the informed consent document. This document contains additional information about my research study. By submitting the informed consent document, you are voluntarily agreeing to participate in my study. Once submitted, I will receive the document and provide you with directions for completion of the demographic survey, Self-Description Questionnaire III items, and open response prompts. Further, I will contact you in order to begin scheduling focus group interviews.

https://goo.gl/forms/jp7vIDFbnlXMQKen2

Appendix I: Self-Description Questionnaire III Matrix

Self-Description Questionnaire III Item Matrix

SDQ III Item	Rationale	Prior Research	Research Question	Theory
I find many mathematical problems interesting and challenging.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I am never able to think up answers to problems that haven't already been figured out.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I have hesitated to take courses that involve mathematics.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I am good at combining ideas in ways that others have not tried.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I have generally done better in mathematics courses than other courses.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
Mathematics makes me feel inadequate.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I enjoy discovering new ways of solving problems.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfiedl & Eccles (2000)
I am quite good at mathematics.	Data collection Triangulation	Cordes (2014)	RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield &

				Eccles (2000)
I'm not very good at problem solving.	Data collection Triangulation	Cordes (2014)	RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I have trouble under-standing anything that is based upon mathematics.	Data collection Triangulation	Cordes (2014)	RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I have a lot of intel-lectual curiosity	Data collection Triangulation	Cordes (2014)	RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I have always done well in mathematics classes.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I never do well on exams that require mathematical reasoning.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
At school, all my friends always came to me for help in mathematics.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I have never been excited about mathematics.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
I can often see better ways to doing routine tasks.	Data collection Triangulation	Cordes (2014)	RQ1 RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)

Note. From the Self-Description Questionnaire III Instrument by H. W. Marsh, 1992.

Appendix J: Focus Group Questions

Focus Group Questions

Standardized Open-Ended Questions

Previous Mathematical Experiences

1. What experiences prior to your remedial mathematics course influenced your motivation to succeed?

In Course Factors Affecting Student Success

2. Describe the factors you would contribute to your success in your remedial mathematics course.
3. Describe how classmates and faculty impact one's motivation to succeed in a remedial mathematics course.
4. Explain how mathematical self-concept, one's belief in their mathematical ability, affects their motivation to succeed at a high level in a remedial mathematics course.
5. If there is a negative connotation that comes with taking a remedial mathematics course, explain how that affects the motivation of a student who is required to enroll.

Personal Beliefs Regarding Overall Importance of the Course

6. Describe the importance of understanding and conceptualizing your remedial mathematics course content and the overall importance of the course in your academic journey.

Appendix K: Semi-structure Face-to-Face Interviews

Semi-Structured Face-to-Face Interviews

Standardized Open-Ended Interview Questions

Opening Questions Meant to Build Rapport with Participants

1. Tell me about yourself, your family, and where you grew up?
2. What is your major of study and why did you choose that major?
3. Why did you choose this university/institution?
4. How important was it to attend an institution of higher education after high school? Why?

Previous Mathematical Experiences

5. Describe your mathematical experiences prior to attending this institution.
   Probe: What are the positive aspects of your previous experiences in math classes?
   Probe: How would you characterize the value found in those experiences?
   Probe: Tell me about the effort you put forth. Was it worth it?
   Probe: Can you compare your past experiences with those had in your remedial mathematics course?
6. Describe the importance your parents and others (i.e., grandparents, teachers, etc.) placed on education prior to attending this institution.
   Probe: How would you characterize the importance a college degree has for you future?
7. Explain the kind of influence previous teachers had on your motivation to succeed in mathematics prior to your remedial mathematics course?
   Probe: Did your remedial mathematics professor influence your success? Why?
8. Prior to attending this institution how would you describe your belief in the value of

learning mathematics and its importance to your future.

Probe: Can you compare your previous value beliefs about learning mathematics to how you view its importance now?

In Course Mathematical Experiences

9. Explain your motivation for completion of your remedial mathematics course with such high success?

   Probe: Can you explain why your motivation is oriented in this way?

10. How would you explain the importance of remedial mathematics and its influence on your motivation to succeed?

11. Explain the influence your class peers had on your motivation to succeed in your remedial mathematics course?

    Probe: Can you give an example of an influential situation?

12. Describe your personal beliefs about your mathematical ability and how it motivated you to succeed at such a high level.

    Probe: What was your expected outcome?

    Probe: Were you surprised by the grade you earned? If so, why?

13. In your persistence to succeed in your remedial mathematics course, explain the necessity to gain a strong understanding of the course concepts.

    Probe: Was concept mastery in your remedial mathematics course essential to your success? Why?

    Probe: Was the outcome worth the effort? Why or why not?

14. Describe your personal reasons for success in your developmental mathematics course. What did you do to succeed? What was the ultimate goal in achieving such high success?

Appendix L: Permission for Usage of the Self-Description Questionnaire III

Institute for Positive Psychology & Education

Research Instruments — Terms and Conditions

1. You must agree to these Terms and Conditions in order to download the IPPE Research Instrument Packages.

2. Each instrument must be correctly referenced (this information is included within each of the packages).

3. Should the use of this instrument lead to any publication, it is a condition of use that the researchers collecting the data, will acknowledge the origins of the instrument (refer to referencing included in each package).

4. Any conditions of use that apply specifically to that instrument or a part of that instrument are adhered to (these are stated within each instrument package).

5. Permission is for the person/group seeking permission to use these instruments and for the purposes indicated in applying, and not for distribution to other researchers or other uses.

6. IPPE retains the option to negotiate access to data based on this Instrument. Identifying information such as names are not required, however, age, gender, location of administration and general description of the respondents will be.

7. IPPE accepts no responsibility, liability or indemnity for misuse of these instruments, or damage to participants during the use of these instruments. Responsibility, liability and indemnity remains with the ethical and professional conduct of the administrators/researchers seeking to use the instruments. It is expected that those who are authorised to use these instruments have qualifications in conducting social research, or are associated with researchers who have the necessary qualifications to conduct research.

8. In using these instruments, the administrators/researchers accept all liabilities and indemnities pertaining to the use of these instruments.

Appendix M: Open Response Prompt Matrix

Open Response Prompts Matrix

Prompt	Rationale	Prior Research	Research Question	Theory
Describe some specific events, actions, or experiences, past or present, that helped lead to your success, indicated your abilty to succeed, or summed up your successful experience in Intermediate Algebra.	Data collection Triangulation	Canfield (2013) Cordes (2014) Howard & Whitaker (2011)	RQ1 RQ2	Ames (1992 Bandura (1986) Wigfield & Eccles (2000)
Describe/discuss the importance of specific habits, actions, or thoughts that are necessary for students to be successful in Intermediate Algebra.	Data collection Triangulation	Canfiled (2013) Cordes (2014) Howard & Whitaker (2011)	RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
Describe how the experience in Intermediate Algebra felt. What was your mindset knowing you were required to take it? How did you feel when you attended class? What was the environment like? How did you view your peers? How did they view you?	Data collection Triangulation	Canfiled (2013) Cordes (2014) Howard & Whitaker (2011)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)

Appendix N: Focus Group Question Matrix

Focus Group Question Matrix

Question	Rationale	Prior Research	Research Question	Theory
What experiences Prior to your Remedial mathematics course influenced your motivation to succeed	Data collection Triangulation	Cordes (2014) Howard & Whitaker (2011)	RQ1	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)
Describe the factors you would contribute to you success in your mathematics course?	Data collection Triangulation	Canfield (2013) Cordes (2014) Howard & Whitaker (2011)	RQ3	Ames (1992) Bandua (1986) Wigfield & Eccles (2000)
Describe how classmates and faculty impact one's motivation to succeed in a remedial mathematics course.	Data collection Triangulation	Canfield (2013) Cordes (2014) Howard & Whitaker (2011)	RQ1 RQ2 RQ3	Ames (1992) Bandura (1986)
Explain how mathematical self-Concept, one's belief in their mathematical ability, affects their motivation to succeed at a high level in a remedial mathematics course	Data collection Triangulation	Canfield (2013) Cordes (2014) Howard & Whitaker (2011)	RQ2	Bandura (1986) Wigfield & Eccles (2000)
If there is a negative connotation that comes with taking a remedial mathmatics course	Data collection Triangulation	Canfield (2013) Cordes (2014) Howard & Whitaker (2011)	RQ1 RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)

explain how that effects the motivation of a student who is required to enroll.				
Describe the importance of understanding and conceptualization your remedial mathematics course content and the overall importance of the course in your academic journey	Data collection Triangulation	Canfield (2013) Cordes (2014) Howard & Whitaker (2011)	RQ1 RQ2 RQ3 RQ4	Ames (1992) Bandura (1986) Wigfield & Eccles (2000)

Appendix O: Interview Question Matrix

Interview Question Matrix

Research Question (RQ)	Interview Question	Theoretical Framework	Data Source
RQ1	Tell me about yourself, your family, and where you grew up.	Bandura (1986) Hatch (2002)	Interview
RQ1	What is your major of Study, and why did you choose that major?	Bandura (1986) Hatch (2002)	Interview
RQ1	Why did you choose this university/institution?	Bandura (1986) Hatch (2002)	Interview
RQ1 RQ2	How important was it to attend an institution of higher education after high school? Why?	Bandura (1986) Wigfield & Eccles (2000) Hatch (2002)	Interview
RQ1 RQ2	Describe your mathe-matical experiences prior to attending this institution. Probe: What are the positive aspects of your previous experiences in math classes? Probe: How would you characterize the value found in those experiences? Probe: Tell me about The effort you Put forth. Was It worth it? Probe: Can you compare your past experiences with those experiences	Bandura (1986) Wigfield & Eccles (2000) Hatch (2002)	Interview

	had in your remedial mathematics course?		
RQ1 RQ2	Describe the importance your parents and others placed on education prior to attending this university. Probe: How would you characterize the importance a college degree has for your future?	Bandura (1986) Hatch (2002) Wigfield & Eccles (2000)	Interview
RQ1 RQ2 RQ3 RQ4	Explain the kind of influence previous teachers had on your motivation to succeed in mathematics prior to your remedial mathematics course. Probe: Did your remedial mathematics professor influence your success? Why?	Ames (1992) Bandura (1986) Hatch (2002) Wigfield & Eccles (2000)	Interview
RQ2	Prior to attending this Institution how would you describe your belief in the value of learning mathematics and its importance to your future? Probe: Can you compare your previous value beliefs about learning mathematics to how you view its importance now?	Hatch (2002) Wigfield & Eccles (2000)	Interview

RQ3	Explain your motivation for completion of your remedial mathematics course with such high success. Probe: Can you explain why your motivation is oriented in this way?	Ames (1992) Hatch (2002) Wigfield & Eccles (2000)	Interview
RQ2 RQ4	How would you explain the importance of remedial mathematics and its influence on your motivation to succeed?	Ames (1992) Wigfield & Eccles (2000)	Interview
RQ3 RQ4	Explain the influence your class peers had on your motivation to succeed in your remedial mathematics course? Probe: Can you give me an example of an influential situation?	Ames (1992) Bandura (1986) Hatch (2002)	Interview
RQ2 RQ3	Describe your personal beliefs in your mathematical ability and how it motivated you to succeed at such a high level. Probe: What was your expected outcome? Probe: Were you surprised by the grade you earned? If so, why?	Hatch (2002) Wigfield & Eccles (2000)	Interview
RQ2 RQ3	In your persistence to succeed in your remedial	Ames (1992) Wigfield & Eccles	Interview

RQ4	mathematics course, explain the necessity to gain a strong understanding of the course concepts. Probe: Was concept mastery essential to your success? Why? Probe: Was the outcome worth the effort? If so, why?	(2000)	
RQ1 RQ2 RQ3 RQ4	Describe your personal reasons for success in your remedial mathematics course. Probe: What did you do to succeed? Probe: What was the ultimate goal in achieving success?	Ames (1992) Wigfield & Eccles (2000)	Interview

Appendix P: Researcher's Reflective Journal

Researcher's Reflective Journal

- Participants' responses to open response prompts describe specific events from their past and teachers who influenced their success. Those events were impactful in that they were both successful memories and negative experiences. Clearly successful students are persistent in their efforts and discuss the need to work hard. The use of available resources looks to be a necessity as a part of this experience. Past teachers had an obvious impact on these individuals. These participants indicate a strong work ethic leading to success due to persistence.
- Response prompts indicate remediation to be a foundational course in how they talk about how much they need to understand course content. Descriptions of the experience indicate participants had a communal feel with their peers, the instructor influences their motivation, and although they had negative thoughts about the course they believe it is a good thing to have remediation . . . it is valuable!
- It seems some participants lacked some self-confidence, yet others felt strong about their ability. That is most likely where the negativity for enrollment in remediation comes from. There is a piece to this, an indication, that student motivation to succeed has at least in part something to do with their mathematical self-concept whether it be positive or negative.
- A few students missed the purpose of prompt #1 and pointed to their remedial mathematics professor. Clearly the instructor has a significant impact on remedial success or the participants wouldn't have gone that direction with their response. One

participant made it clear seeking help from the professor is necessary and helpful. Working with peers is also indicated as important to succeed.

- Participants in the first focus group interview indicate high school math experiences were impactful on their success in remediation. When the class was hard, they worked harder. They needed to understand . . . hard work was necessary. Having to remediate is considered valuable, a good foundation. Indications of negativity mentioned because of enrolling in a zero level course. Similarly to open response prompts focus group one participants found working with others very helpful and were passionate about the impact the professor had on their success. I'm seeing this as a significant aspect of their experience. Working with others/Truly Caring Instructor/Approachable Instructor.
- Focus group two participants again described the impact prior teachers have had on their success. In probing these participants they discussed the approach prior teachers took pedagogically, emphasizing necessary processes, focusing where students struggled to comprehend concepts, and pointing students towards other options for help. The quality of their prior instructors was an important aspect to their future success in remediation. This important aspect to success was evident in the group's further emphasis of the remedial instructor's influence on them. Participants continue to discuss feelings of frustration/negativity with having to remediate, yet found value in the course. Starting to recognize the persistence these participants had to be successful is influenced by a growth mindset and the need to develop a holistic/mastery understanding of course content. My probe regarding a stigma with remediation opened participants up to discussing a stigma felt amongst peers and family members. This is an area I would like to look into more.

- Clearly, prior experiences in mathematics impacted their success in remediation. It impacts their confidence, motivates them to prove their ability, and intrinsically motivates them to succeed. Again, whether these experiences are positive or negative, they find motivation from their past. Frustration with enrollment is clearly evident. They all find value in the course and they are no longer frustrated soon after enrollment. This looks to be a key piece to their successful experience. Focus group three discussed the positive aspects of working with peers, how important it was to their success. Participants felt they belonged, were in it together, accountability to others. There was comfort in working with others.

  There are signs of positive and negative self-efficacious beliefs. Those with prior negative self-efficacious beliefs found confidence during remediation. Those with positive self-efficacious beliefs added to their math confidence while remediating. Growth mindset comes back into play here . . . the instructor had a major influence on this and their success. Again, this group of participants believed this experience provided them with a strong foundation for future courses.
- Focus group three felt the stigma with enrolling in remediation. They actually avoided saying the course name . . . referred to the class as simply "Algebra" . . . they didn't want to look less than in comparison to others. Embarrassed. Peer Expectation. Difficult. That doesn't count. Yet, for some the stigma motivated them similarly to having negative prior experiences.
- There is an attitude change for these students. They are unhappy with remediating, but they all want to learn, build a solid foundation, in some cases prove it to themselves they

can be successful . . . they find the course valuable. Seen as necessary step toward college level success.

- Holistic understanding, (mastery of course content?) is very important
- Focus group four confirmed prior thoughts
    - Prior negative beliefs motivate participants to succeed, to prove they can be successful
    - Remediation was a necessity for future math and major courses
    - The course instructor had a significant impact on the success of the participants; this is a significant piece of the pie (caring, approachable, genuine)
    - Working with peers helped increase understanding and a feeling of belonging, a sense of community
    - Remediation is considered a foundational course . . . supportive course for future math and major courses.
    - Indications of growth mindset in support of persistence to gain success; using several resources to earn success
- Higher education is an important piece; a need to learn. Positive self-efficacious beliefs evident in individual interviews. What seems to be incredibly important is the influence parents, family, and other had on participant belief in the value of education; influencing their work ethic, influencing the value of learning.
- Further emphasis of the impact the remedial instructor has on student success. Emphasis on the care the professor showed, the ability to motivate students to succeed . . . class was enjoyable (community feel); remediation is valued and its value is emphasized by the participants.

- Participants saw value in a strong understanding of course concepts (holistic understanding); Participants also wanted to earn an 'A;' that was important. Peer influence is huge in not only success, but also in building a sense of community.
- Working with peers inspires/motivates successful remedial math students. They find value in working with others and indicate it to be an important component to their success.
- Individual interviews indicate further evidence successful students find value in remediation. It supports college level mathematics/future courses/future in general.
- Break Down of Possible Themes
    - Remediation is Valuable
        - Foundation for College Math
        - Supports Future Courses
        - Strong Foundation
        - Holistic Understanding
    - Quality Instruction/Quality of Instructor?
        - Approachable/Helpful
        - Truly Caring
        - Quality of Instructor Influence?
    - Negative Initial Attitude/Change in Attitude
        - Low Self-Efficacious Beliefs
        - Stigma with Non-Remedial Peers
        - Disappointing Placement
        - Embarrassment

- Sense of Community/Comfortable Environment/Relaxed Atmosphere?
    - Group work/peer work
    - Value in helping others
    - Peer Influence
    - “Same Boat”
- Exhaustion of Resources/Persistence
    - Hard work
    - Practice
    - Seeking Help

Appendix Q: Self-Description Questionnaire III Results

Table R1

SDQ III Results with Numeric Assignments

	I find many mathematical problems interesting and challenging.	I am never able to think up answers to problems that haven't already been figured out.	I have hesitated to take courses that involve mathematics.	I am good at combining ideas in ways that others have not tried.
Andrew	7	2	5	8
Bethany	4	3	2	5
Colene	1	6	7	1
Donna	5	4	1	4
Evie	6	4	1	7
Farah	7	4	2	5
Gretchen	7	7	2	3
Heather	6	6	5	2
Jason	5	3	6	6
Kelly	3	8	5	5
Mean Value	5.2	4.8	3.6	4.7

Table R2

SDQ III Results with Numeric Assignments

	I have generally done better in mathematics courses than other courses.	Mathematics makes me feel inadequate.	I enjoy discovering new ways of solving problems.	I am quite good at mathematics.
Andrew	5	1	8	6
Bethany	6	4	3	5
Colene	7	5	2	4
Donna	8	2	5	7
Evie	8	3	8	8
Farah	7	2	5	5
Gretchen	7	2	6	7
Heather	3	2	6	5
Jason	6	4	6	6
Kelly	1	3	5	5
Mean Value	5.6	2.8	5.3	5.7

Table R3

SDQ III Results with Numeric Assignments

	I'm not very good at problem solving.	I have trouble understanding anything that is based upon mathematics.	I have a lot of intellectual curiosity.	I have always done well in mathematics classes.
Andrew	3	3	8	6
Bethany	2	2	5	5
Colene	5	5	2	7
Donna	2	4	7	8
Evie	1	3	6	8
Farah	4	4	7	7
Gretchen	2	1	2	6
Heather	6	3	6	5
Jason	3	5	7	6
Kelly	3	2	6	3
Mean Value	3.1	3.3	5.7	6.1

Table R4

SDQ III Results with Numeric Assignments

	I never do well on exams that that require mathematical reasoning.	At school, all my friends always came to me for help in mathematics.	I have never been excited about mathematics.	I can often see better ways of doing routine tasks.
Andrew	4	6	2	5
Bethany	4	7	5	5
Colene	5	2	8	4
Donna	3	5	3	6
Evie	1	6	1	6
Farah	2	6	1	6
Gretchen	2	5	2	5
Heather	5	2	5	8
Jason	5	6	6	6
Kelly	4	1	8	4
Mean Value	3.5	4.5	4.1	5.5

Appendix R: Open Code Enumeration Table

Open Code Enumeration Table

Open Code	Number of times Occurred	Total Number of Times Occurred Across Data	Themes Identified
Approachable/ Helpful Instructor	Open Response = 12 Focus Group = 59 Interview = 47	391	Quality of Instructor
Instructor Influence	Open Response = 15 Focus Group = 70 Interview = 7	92	Quality of Instructor
Perceived Quality Instruction	Open Response = 14 Focus Group = 71 Interview = 1	86	Quality of Instructor
Truly Caring Instructor	Open Response = 9 Focus Group = 28 Interview = 42	79	Quality of Instructor
Increased Understanding with Varying Approaches	Open Response = 0 Focus Group = 9 Interview = 0	16	Quality of Instructor
Negative Initial Attitude	Open Response = 16 Focus Group = 45 Interview = 30	91	Change in Attitude
Disappointing Placement	Open Response = 1 Focus Group = 51 Interview = 10	62	Change in Attitude
Positive Attitude	Open Response = 2 Focus Group = 28 Interview = 8	38	Change in Attitude
Stigma with Non-Remedial Peers	Open Response = 0 Focus Group = 35 Interview = 0	35	Change in Attitude
Success Leads to Success	Open Response = 6 Focus Group = 10 Interview = 11	27	Change in Attitude
Success Builds Confidence	Open Response = 2 Focus Group = 18 Interview = 0	20	Change in Attitude
Building Self-Concept	Open Response = 0 Focus Group = 8 Interview = 10	18	Change in Attitude

Open Code	Number of times Occurred	Total Number of Times Occurred Across Data	Themes Identified
Embarrassment	Open Response = 0 Focus Group = 10 Interview = 0	10	Change in Attitude
Feelings of Stupidity	Open Response = 0 Focus Group = 8 Interview = 1	9	Change in Attitude
Low Self-Efficacious Beliefs	Open Response = 1 Focus Group = 50 Interview = 25	76	Previous Math Outcomes
Positive Self-Efficacious Beliefs	Open Response = 1 Focus Group = 32 Interview = 24	67	Previous Math Outcomes
Previous Success	Open Response = 4 Focus Group = 3 Interview = 25	32	Previous Math Outcomes
Historical Struggle/Dislike	Open Response = 0 Focus Group = 13 Interview = 7	20	Previous Math Outcomes
Strong Prior Foundation	Open Response = 2 Focus Group = 12 Interview = 5	19	Previous Math Outcomes
Holistic Understanding	Open Response = 11 Focus Group = 63 Interview = 48	122	Motivation due to Mastery and Performance – Need to Understand Course Content
Mastery Goals	Open Response = 1 Focus Group = 4 Interview = 53	65	Motivation due to Mastery and Performance – Need to Understand Course Content
Growth Mindset	Open Response = 0 Focus Group = 9 Interview = 14	23	Motivation due to Mastery and Performance – Need to Understand Course Content
Personal Persistence	Open Response = 15 Focus Group = 16 Interview = 45	76	Persistence

Open Code	Number of times Occurred	Total Number of Times Occurred Across Data	Themes Identified
Practice is Necessary	Open Response = 11 Focus Group = 9 Interview = 10	30	Persistence
Individual Work	Open Response = 6 Focus Group = 8 Interview = 0	14	Persistence
Motivated to Learn	Open Response = 0 Focus Group = 14 Interview = 0	14	Persistence
Seeking Help	Open Response = 29 Focus Group = 13 Interview = 8	50	Exhaustion of Available Resources
Seeking Resources	Open Response = 10 Focus Group = 11 Interview = 19	40	Exhaustion of Available Resources
Performance Goals	Open Response = 1 Focus Group = 14 Interview = 33	68	Motivation due to Mastery and Performance – Motivation by Grade
Higher Education is Important	Open Response = 0 Focus Group = 8 Interview = 43	51	Belief in the Importance of Higher Education
Prior Teaching is Important	Open Response = 4 Focus Group = 6 Interview = 30	40	Quality of Teacher Prior to Remediation
Influential People	Open Response = 0 Focus Group = 0 Interview = 22	22	Emphasis on Academics by Influential People
Parental Support	Open Response = 0 Focus Group = 0 Interview = 17	17	Emphasis on Academics by Influential People