# A HERMENEUTICAL PHENOMENOLOGICAL STUDY EXPLORING THE EXPERIENCES OF COLLEGE ALGEBRA AMONG ENGLISH MAJORS

by

Kelli Marie Thomas

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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APPROVED BY:

Laura E. Jones, Ph.D., Committee Chair

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## Abstract

The purpose of this hermeneutical phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. Experiences were defined as the interactions that have occurred between an individual and other objects and people. The theories guiding this study were Bandura's social cognitive theory and Atkinson's expectancy-value theory as they helped to explain why English majors may not have had positive experiences in mathematics. This was a hermeneutical phenomenological study utilizing purposeful convenience sampling of students at Thomas University in the southeastern United States. Data was collected from students majoring in English that had taken college algebra using interviews, journal prompts, and focus groups in order to answer the central research question, "What are the experiences of college students majoring in English in their required college algebra course?" The data was analyzed, looking for significant statements, and then those statements were developed using van Mannen's thematic analysis method. What the participants had experienced was compared, as well as how they had experienced it. The study determined if college students majoring in English have had positive or negative experiences in their college algebra classes. Three themes that emerged included poor experiences in college algebra, where students felt that they were "just checking boxes," a desire for a different option than college algebra as a mathematics requirement, and a feeling that there was nothing for them in their college algebra. The main takeaway from this study is that students at Thomas University would like to have an option for a mathematics course that includes more practical concepts and that ties mathematics and English together.


*Keywords*: English major, college algebra, mathematics, math pathways, phenomenology, social cognitive theory, expectancy-value theory

## Copyright Page

## Dedication

I dedicate this dissertation to God, my Lord and Savior! Praise be to the One who is my good, good Father.

I dedicate this to my husband, who encouraged me every step of the way and believed in me, even when I did not believe in myself. I could not have done it without you, my love!

I dedicate this to my parents, who showed me the value of pursuing education, no matter how late in life.

I dedicate this to my children, Laura Marie, Myles, Zack, Autumn, Scott, and Jake, who were so patient and understanding with me while I worked. I hope I have made you proud and inspired you to pursue knowledge throughout your lives.

I dedicate this to my high school English teacher, Mary Ann Stotts, who taught me to write well and demanded excellence in everything.

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Thank you to Dr. Laura Jones, my dissertation chair. Your knowledge and guidance were invaluable to me through this process. Thank you to Dr. Mark Hogue, for agreeing to serve as my committee member without knowing anything about me and for your willingness to offer your expertise throughout. Thank you to my professors, who were constantly encouraging me and providing me with feedback that allowed me to be successful.

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## List of Abbreviations

Biological Sciences, Computer Science, and Other STEM fields (BCO)

California Acceleration Project (CAP)

Center for the Analysis of Postsecondary Readiness (CAPR)

College Entrance Examination Board (CEEB)

Common Core State Standards for Mathematics (CCSSM)

Dana Center Mathematics Pathways (DCMP)

Motivated Strategies for Learning Questionnaire (MSLQ)

Occupational Information Network (O*NET)

Organization for Economic Cooperation and Development (OECD)

Physical Sciences, Engineering, and Mathematics (PEM)

Programme for International Student Assessment (PISA)

Rate of students earning a grade of D, F, or W (DFW rate)

Science, Technology, Engineering, and Mathematics (STEM)

# CHAPTER ONE: INTRODUCTION

## Overview

Students who graduate from high school are often excited about the idea of attending college, earning their degrees, and beginning their careers. Unfortunately, many of them never achieve those goals due to being unable to pass college algebra (Burdman, 2013; Herriott & Dunbar, 2009; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020). This chapter shows how college algebra became a problem for college students, why it is a problem today, and how this problem affects students, specifically English majors. For this study, the researcher desired to identify what challenges students majoring in English face in college algebra. This is significant, because English students who cannot pass college algebra will not be able to graduate and pursue a career in their major; if the course was not required, they would possibly be successful in their endeavors. Furthermore, although college algebra is required to earn their degrees, it may not offer them any skills that would be necessary for them to do their future jobs (Blumenthal, 2016; Burdman, 2013; Strauss, 2019). Bandura's (1986) social cognitive theory and Atkinson's (1964) expectancy-value theory are guiding the research. This chapter presents the background of the topic, including the historical, social, and theoretical contexts, the problem statement, the purpose of the study, and the significance of the study, including the theoretical, empirical, and practical significance. The chapter concludes with the research questions guiding the study, definitions of the key terms, and a summary.

## Background

College algebra became a requirement for most post-secondary schools after the Soviet Union launched the satellite, Sputnik, in 1957 (Baker, 2019; Lynch, 2018). Prior to this, college algebra was offered, but it was not required (Baker, 2019; Furr, 1996; Tucker, 2013). Students

are affected by this requirement because many of them are unable to pass it (Blumenthal, 2016; Ganga & Mazzariello, 2018; Shakerdge, 2020; Strauss, 2019) which will prevent them from being able to graduate from college. Additionally, most students do not need college algebra to have successful careers (Blumenthal, 2016; Burdman, 2013; Ganga & Mazzariello, 2018; Strauss, 2019).

**Historical Context**

When colleges were formed in the 1700s and 1800s, mathematics was not a part of the science and engineering studies; rather, it was considered a classical art (Tucker, 2013). Mathematics was considered a way to train the mind as opposed to a way to prepare students for science and engineering jobs (Baker, 2019). As more students received a more rigorous college preparatory instruction in high school and began attending college, the difficulty level of college mathematics also increased; however, mathematics was not a required course for all college students. In fact, in the early 1900s, most colleges went to an all-elective curriculum (Tucker, 2013) which meant that most students still did not take a mathematics course. It was also around this time that mathematics began being associated with the natural sciences, so even after a core curriculum was widely adopted at the college level, students were able to take a science class instead of a mathematics class.

It was not until the Soviet Union launched Sputnik in 1957 that Americans became very concerned with all college students needing to take a mathematics course (Baker, 2019; Furr, 1996; Tucker, 2013). President Dwight Eisenhower had formed the Committee on Education Beyond the High School in 1956. In 1957, due to their report and the launch of Sputnik, he decided that America needed more scientists and engineers to compete with the rest of the world (CQ Almanac, 1957; Sheffey, 2021). The first push toward that goal was geared towards college

students (Baker, 2019; Furr, 1996), and Eisenhower requested that Congress authorize grants of $2.5 million each year for the next three years to colleges around the country (CQ Almanac, 1957). When Kennedy was elected in 1960, he continued this push. His desire to put an American on the moon by the end of the decade caused more colleges to require mathematics as part of the curriculum (Taylor, 2017). However, rather than colleges developing mathematics courses that were relevant to each student's field of study, college algebra became the default mathematics course for all students (Ganga & Mazzariello, 2018).

**Social Context**

College students are most affected by the requirement to take college algebra, even if it does not offer them anything useful for their future jobs. With almost every college major now requiring college algebra as the default mathematics course of the core curriculum, college students often see college algebra as a blockade to their graduation rather than as a steppingstone to their degree (Blumenthal, 2016; Strauss, 2019). Additionally, there is evidence that the course does nothing to help prepare English majors for success in their careers or in their lives (Burdman, 2013; Strauss, 2019). College algebra is designed to help students prepare for a calculus course rather than for real life (Blumenthal, 2016; Ganga & Mazzariello, 2018; Skuratowicz et al., 2020), and it is a repeat of algorithms that most students have had in high school and that mean nothing to them (Blumenthal, 2016; Skuratowicz et al., 2020). It is no wonder that English students are not interested in their college algebra course, and multiple studies have shown that interest is a major factor in student achievement (Kosiol et al., 2019; Rach & Heinze, 2017; Skuratowicz et al., 2020). One survey research study of 9703 Turkish students by Koyuncu (2020) showed that interest does affect student achievement; using linear regression, the researcher found a correlation of .11, which is significant.

Colleges are affected by the number of students failing college algebra and withdrawing from school. When students are interested in the contents of their program, they are more likely to have study satisfaction, to have higher academic achievement, and to stay in college; when they are less interested in their courses, they are at a higher risk of poor academic achievement or dropping out (Kosiol et al., 2019; Skuratowicz et al., 2020). For colleges that have a broader view of the true purpose of education—to prepare students for life after college—it is time to focus on the individual student needs rather than a generic curriculum (Strauss, 2019).

## Theoretical Context

Research has been done to investigate the issues surrounding students being required to take college algebra. There is evidence to indicate that self-efficacy is a major factor in learning mathematics (Koyuncu, 2020; Melnikova, Long, & Stocker, 2020; Rach & Heinze, 2017). Additionally, studies show that student interest also plays a large role in learning mathematics (Geisler & Rolka, 2021; Kosiol et al., 2019; Rach & Heinze, 2017; Schnettler et al., 2020). Studies have shown that theories such as Bandura's (1986) social cognitive theory and Atkinson's (1964) expectancy-value theory are appropriate when it comes to learning about students' attitudes towards college algebra. This study added to the body of research, as it dealt specifically with the attitude of college students majoring in English towards their college algebra class.

## Problem Statement

The problem is most students are required to take college algebra (Blumenthal, 2016; Ganga & Mazzariello, 2018), even though it is unnecessary for their careers (Blumenthal, 2016; Burdman, 2013), approximately half of them are failing the course (Ganga & Mazzariello, 2018; Shakerdge, 2020; Strauss, 2019), and many are unable to complete college because they cannot

pass the required college algebra course (Burdman, 2013; Melnikova, Long, & Stocker, 2020). The core curriculum most colleges require for all majors, including English, includes a course in mathematics (Fleming, 2019; Lei & Lei, 2019), and the default mathematics course for the majority of them is college algebra (Blumenthal, 2016; Ganga & Mazzariello, 2018). In fact, some post-secondary schools actually require two college algebra courses (Burdman, 2013). Even schools that allow their students to choose from a list of courses typically have college algebra as the minimum for the mathematics requirement (Lei & Lei, 2019; Poliakoff, 2020; Reyes, 2010). However, evidence shows that student achievement in college algebra is very low (Burdman, 2013; Childers et al., 2021; Ganga & Mazzariello, 2018; Harrell & Lazari, 2020; Lei & Lei, 2019; Pearce et al., 2017; Skuratowicz et al., 2020). As a matter of fact, college algebra is the single most commonly failed class at the community college level (Ganga & Mazzariello, 2018; Strauss, 2019). On average, only about half of all the students who take college algebra earn a grade of C or higher (Saxe & Braddy, 2015; Shakerdge, 2020), and only 20% of students who are first required to take a remedial mathematics course pass college algebra (Burdman, 2013). Many students are becoming frustrated, failing, and withdrawing from the course (Burdman, 2013; Herriott & Dunbar, 2009; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020). At most colleges, if students cannot pass college algebra, they cannot graduate.

## Purpose Statement

Based on the literature that shows the low achievement in college algebra (Burdman, 2013; Childers et al., 2021; Ganga & Mazzariello, 2018; Harrell & Lazari, 2020; Lei & Lei, 2019; Pearce et al., 2017; Skuratowicz et al., 2020) and the literature that indicates there is nothing in college algebra to help most students in their careers (Blumenthal, 2016; Burdman, 2013; Ganga & Mazzariello, 2018; Stewart, 2018; Strauss, 2019), the researcher was interested

in learning about the experiences of college algebra among a specific group of students. The group of students the researcher expected to be least likely to need college algebra was English majors. Therefore, the purpose of this qualitative hermeneutical phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. Experiences were defined as the interactions that have occurred between an individual and other objects and people (Dewey, 1938). Experiences can be positive, negative, or neutral.

## Significance of the Study

This study is theoretically, empirically, and practically significant. It is theoretically significant because it builds on the social cognitive theory and the expectancy-value theory and will add to the body of literature about them. It is empirically significant because it reinforces other studies that have been done about the relationship between these theories and students taking college algebra. It is practically significant because it can be replicated by other researchers and used to affect change.

### Theoretical Significance

To understand the phenomenon being investigated, it is imperative to understand Bandura's (1986) social cognitive theory and Atkinson's (1964) expectancy-value theory. Self-efficacy is a vital part of the social cognitive theory (Bandura, 1986; Eun, 2019). It is crucial to understand how important self-efficacy is to students learning college algebra; students need to believe they are capable of learning the material in order to do well in the course. The expectancy-value theory specifically states that motivation is positively or negatively affected by what people believe they will receive in return for their success or failure (Atkinson, 1964). If students do not believe they will receive anything of value from a college algebra course, they are not going to be motivated to do well, and motivation is the single greatest predictor of

whether or not a student will be successful in a class (Broadbent, 2016) or drop out of it (Schnettler et al., 2020). As common threads emerged in this study, they added to the literature, as there was nothing that specifically showed the relationship between Bandura's (1986) social cognitive theory and the experiences of college algebra among college English majors, nor Atkinson's (1964) expectancy-value theory and the experiences of college algebra among college English majors.

**Empirical Significance**

This study is empirically significant since it reinforces the evidence from other studies (Blumenthal, 2016; Burdman, 2013; Gilyazova et al., 2020; Lei & Lei, 2019; Poliakoff, 2020; Skuratowicz et al., 2020) that have indicated college algebra may not need to be a part of the core curriculum; a major-specific mathematics course could increase student achievement for English majors. It also added to the literature in these areas because there is nothing that specifically discusses the phenomenon of the experiences of English majors in their college algebra courses. There has been research that has debated the effectiveness of the current core curriculum, including college algebra (Burdman, 2013; Gilyazova et al., 2020; Lei & Lei, 2019; Poliakoff, 2020; Skuratowicz et al., 2020). This study explored the challenges and successes that English majors have had with college algebra, and this study may be used to help determine if college algebra should be part of the core curriculum for all students. This study can also be replicated to understand the phenomenon of experiences students with other majors have had in college algebra. Additionally, there are a few colleges that have introduced math pathways, which are different mathematics courses designed for students in different majors (Blumenthal, 2016; Ganga & Mazzariello, 2018). This study could also be used to help determine if those math pathways are a better option for English majors than college algebra.

### Practical Significance

Finally, this study is practically significant, since it could be used to affect change in the way colleges offer mathematics to their students, especially their students who are majoring in English. As the literature was synthesized and the interviews were collected and analyzed, this study discusses the experiences that English majors have had in their college algebra courses. It reveals the opinions of those students on the value they see in college algebra, and it shows their opinions on what mathematics concepts they feel will be most needed in their careers. Furthermore, the research discusses the thoughts of English majors on whether or not colleges could see improvement in mathematics achievement and an increase in the graduation rates of English majors by switching to math pathways rather than having all students majoring in English take college algebra. There are many changes that are required in order to implement math pathways at colleges, and research has to support a need for it before those changes can even begin (Ganga & Mazzariello, 2018). As this research focuses on the experiences that students majoring in English have had in college algebra, it could be used as a springboard to determine if the math pathways would be a better option for English majors and other majors, as well.

## Research Questions

This research study involved current college students who are majoring in English and who have already taken college algebra. I conducted personal interviews with all of the participants. In addition, the students responded to journal prompts and participated in focus groups. In order to understand the experiences of college algebra among English majors, this research aimed to answer the following questions.

### Central Research Question

What are the experiences of college students majoring in English in their required college algebra course?

**Sub-Question One**

What expected benefits do English majors believe they will receive in their field of study from their required college algebra course?

**Sub-Question Two**

What course content would English majors like to see included in their required college algebra course or as an alternative to college algebra for their undergraduate core mathematics curriculum?

**Sub-Question Three**

What mathematics abilities do English majors feel they need to learn in order to do their expected future jobs?

## Definitions

1. *Core curriculum* – The core curriculum is defined as the body of knowledge, skills, and attitudes expected to be learned by all students, generally related to a set of subjects and learning areas that are common to all students, such as languages, mathematics, arts, physical education, science and social studies (International Bureau of Education, 2022).
2. *English Major* – For the purposes of this study, an English major will be defined as someone who takes a minimum of 45 hours in undergraduate English courses. Depending on the concentration, a minimum of 27 of those hours will be required courses, with the remaining 18 hours being electives from the 300-400 level (University of North Alabama, 2022).

3. *Experiences* – Experiences were defined as the interactions that have occurred between an individual and other objects and people (Dewey, 1938).
4. *Math pathways* – Math pathways are mathematics courses that students are allowed to take in college that may follow a different path than college algebra so that they learn mathematics concepts that are relevant to their majors (Ganga & Mazzariello, 2018).
5. *Remediation* – Remediation is activities or programmes aimed at helping students with learning difficulties or supporting students that may need to develop better learning skills as well as master content (International Bureau of Education, 2022).
6. *Self-efficacy* – Self-efficacy is a personal judgment of how well or poorly a person is able to cope with a given situation based on the skills they have and the circumstances they face (Bandura, 2010).

## Summary

In summary, the problem is most students are required to take college algebra (Blumenthal, 2016; Ganga & Mazzariello, 2018), even though it is unnecessary for their careers (Blumenthal, 2016; Burdman, 2013), approximately half of them are failing the course (Ganga & Mazzariello, 2018; Shakerdge, 2020; Strauss, 2019), and many are unable to complete college because they cannot pass the required college algebra course (Burdman, 2013; Melnikova, Long, & Stocker, 2020). The purpose of this hermeneutical phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. This study is important, because students who are majoring in English, but who cannot pass college algebra, may not be able to pursue careers in which they could be very successful. However, if there was another mathematics option for those students, they might complete their coursework, graduate with their degrees, and have successful careers. Studies have shown that students are more

successful if they have positive self-efficacy (Eun, 2019; Krouss & Lesseig, 2020; Núñez-Peña & Bono, 2019) and if they are motivated by their interests (Kosiol et al., 2019; Rach & Heinze, 2017; Skuratowicz et al., 2020). If English majors had a mathematics option that was more related to their major, they may be more likely to have positive self-efficacy and more interested in learning the mathematics content.

# CHAPTER TWO: LITERATURE REVIEW

## Overview

An extensive review of the recent literature was done to gain insight to the theories guiding this study that was seeking to determine the essence of the experiences of college algebra among English majors. Additionally, the literature was reviewed to obtain other information about the issues surrounding the study at hand. This chapter will present a review of the current literature related to that topic: English majors taking college algebra. In the first section, the social cognitive theory and the expectancy-value theory are discussed, along with how they are guiding the study. Next, literature regarding college algebra as part of the core curriculum is addressed. Then, literature regarding the relationship between mathematics and careers is considered. Following that, a synthesis of recent literature regarding low student achievement in college algebra is presented. Lastly, a review of the literature about ways to increase student achievement is examined. At the end, a gap in the literature is identified, presenting a viable need for the current study.

## Theoretical Framework

Bandura's (1986) social cognitive theory and Atkinson's (1964) expectancy-value theory were the two theories framing this study. Their viewpoints on modeling, scaffolding, self-efficacy, and motivation were all examined and are discussed. The literature presented here will show the significance of these two theories for understanding this study.

### Social Cognitive Theory

The first theory guiding this study was Bandura's (1986) social cognitive theory. This theory focuses mostly on modeling (Abdullah et al., 2020; Bandura, 1986; Belland et al., 2020; Schunk, 2020) and self-efficacy, (Abdullah et al., 2020; Bandura, 1986; Eun, 2019; McAnally,

2019). Furthermore, another part of Bandura's (1986) social cognitive theory involves the perception of the transferability of a new skill to other areas of a person's life. This theory is appropriate for this study because modeling and self-efficacy are two valuable components for teaching and learning mathematics, and students often want to know how they can use mathematics in their everyday lives before they are willing to attempt to learn the new concepts being presented.

Bandura (1986) observed people and noticed that they learned both by doing things themselves and by watching others. He realized that people made choices based on what they saw others doing; people tended to model behavior they saw being rewarded or having favorable outcomes, and they avoided behavior they saw being punished or having unfavorable outcomes (Abdullah et al., 2020; Bandura, 1986; Belland et al., 2020). In fact, Bandura (1986) wrote in his book *Social Foundations of Thought and Action: A Social Cognitive Theory* that if a person could learn through only his or her own actions, the processes of cognitive and social development would not only be much slower, but they would also be much less exciting. Thus, modeling was included in his social cognitive theory because it would be an effective way of teaching; students could mimic their instructors, and they would be rewarded with praise or other positive reinforcement when they mastered a new concept.

Additionally, self-efficacy is one of the most important parts of the social cognitive theory (Abdullah et al., 2020; Bandura, 1986; Eun, 2019; McAnally, 2019; Melnikova, Long, & Stocker, 2020; Stewart et al., 2020). This means that people must believe they are capable of success before they are willing to try something new, especially if they perceive the new task as challenging (Bandura, 1986; Eun, 2019; McAnally, 2019; Schunk, 2020; Stewart et al., 2020). According to Bandura (1986), the skills that a person already possess are not the only factors in

their willingness to try something new, but also what more a person thinks he or she could do with the prospective new skill (McAnally, 2019). If people feel that having a new skill can benefit them in some way, they will be more eager to learn and use it; if people do not see any future benefit to having the new skill, they will be less likely to attempt it (Bandura, 1986; McAnally, 2019). Self-efficacy was included in the social cognitive theory because Bandura (1986) realized that students would be more likely to attempt to learn new skills if they believed in themselves and if they felt like they could use the new skill in other areas of their lives (McAnally, 2019).

Finally, Bandura (1986) recognized that people are more capable of learning difficult things if they are guided through the learning process, so he also included scaffolding in his theory (see also Belland et al., 2020; Schunk, 2020). Scaffolding means that a teacher allows a student to do something on his or her own as much as possible, but then the teacher helps that student through the process as needed until he or she is capable of completing the task completely unassisted (Bandura, 1986; Belland et al., 2020; Schunk, 2020); it is necessary for the teacher to adjust his or her instructions based on each student's needs (Belland et al., 2020). As the student follows the teacher's instructions, he or she should not simply memorize the information; the student needs to gain new knowledge by using knowledge he or she already has (Ay Emanet & Kezer, 2021).

Relating this theory to education, teachers can make a difference in the achievement of their pupils by showing their students what to do, encouraging their students to believe in themselves, and providing the necessary support as their students are learning new concepts until they are capable of completing the task on their own. Scaffolding can also take place outside of the classroom with supplemental supports and extra instruction outside of the regular class time

(Brower et al., 2018). Bandura concluded that students would be more successful if they had someone who guided them, believed in them, and helped them along the way (Bandura, 1986; Schunk, 2020).

**Expectancy-Value Theory**

The second theory guiding this study was Atkinson's (1964) expectancy-value theory. This theory involves students' motivation to learn new things being positively or negatively affected by what they believe they will receive in return for their success or failure (Atkinson, 1964; Schunk, 2020). Like Bandura's (1986) social cognitive theory, another factor in the expectancy-value theory is self-efficacy (Atkinson, 1964; Griffin et al., 2020; Schunk, 2020). Atkinson's (1964) expectancy-value theory is appropriate for this study because students may work harder or not as hard in their mathematics class based on what they feel like they will receive if they do well or if they fail the course; it is also appropriate because self-efficacy is vital for learning mathematics.

Atkinson (1964) concluded that motivation is positively or negatively affected by what people believe they will receive in return for their successes or failures. In other words, the value of what people expect to receive for their efforts is a key part of their decisions to attempt, or not to attempt, new things. Atkinson (1964) wrote that people decide whether or not to attempt a new task based on how valuable the outcome of success is to them. Further explanation of the expectancy-value theory states that not only do people hesitate to try new things if they do not believe there will be a valuable outcome, but they also are less likely to attempt things if they do not believe they will be successful at the task (Atkinson, 1964; Schunk, 2020). Atkinson (1964) also wrote that people size up new challenges and make a decision about whether or not to attempt them not only based on the value of their success, but also on their expectancy of

successful completion. In education, students will be more likely to try to learn a new concept if they can see how it will be useful to them, and they also need to believe they will be successful in learning it.

Additionally, self-efficacy is a major portion of the expectancy-value theory (Atkinson, 1964; Griffin et al., 2020). That is to say, if a person does not believe he or she is capable of success, the fear of failure or embarrassment will prevent him or her from even attempting a task (Atkinson, 1964; Griffin et al., 2020; Schunk, 2020). Applying this concept of the expectancy-value theory to education, teachers are capable of motivating students using positive reinforcement, especially if that reinforcement is something students deem valuable, and teachers can discourage inappropriate behavior in the classroom by using negative reinforcement (Schunk, 2020). Additionally, if teachers encourage students and show that they believe in their students' abilities, the students will have more self-efficacy and will be more willing to try to learn something new (Schunk, 2020).

Together, these two theories framed this research as the experiences of English majors in their college algebra course were examined. Although most mathematics classes can be taught through modeling and scaffolding, Bandura's (1986) social cognitive theory also includes self-efficacy. This research sought to determine if English majors are more confident in their abilities with college algebra, a subject they are familiar with from high school, or if they would have been more comfortable in a mathematics course relating to their major, a subject they have chosen for a career and, therefore, probably feel confident about. Additionally, the research discusses the findings of what mathematics concepts English majors think they will need to know in order to be successful in their careers.

The literature presented here also provides evidence that students are known to have

higher academic achievement if they have higher self-efficacy. Furthermore, Atkinson's (1964) expectancy-value theory includes both self-efficacy and the importance of people expecting a valuable outcome from their efforts. Along with seeking to determine which course students would feel more confident taking, this research also sought to discover if students majoring in English felt that college algebra provided them a more valuable outcome than a major-specific mathematics course would have, or vice-versa. The following literature review also shows that students' achievement is positively related to them feeling that their success in their college algebra course will provide a valuable outcome. Finally, the literature presented here discusses evidence that students are known to have higher academic achievement if they have higher self-efficacy, and it gives recommendations of what schools and instructors can to do to help improve students' self-efficacy.

## Related Literature

The literature reviewed shows that college students majoring in English, like all other college students, are typically required to take a mathematics course as part of the core curriculum (Blumenthal, 2016; Ganga & Mazzariello, 2018; Korth et al., 2018; Lei & Lei, 2019; McKaig, 2018; Reyes, 2010; Tunstall, 2018). The lowest acceptable mathematics course required for the core curriculum at the majority of colleges is most often college algebra (Blumenthal, 2016; Ganga & Mazzariello, 2018; Korth et al., 2018). The literature presented here also explains some of the struggles that many students have in their college algebra courses (Blumenthal, 2016; McKaig, 2018; Skuratowicz et al., 2020; Tunstall, 2018), as well as efforts that many colleges have made to try to increase student achievement in college algebra (Korth et al., 2018; McKaig, 2018; Skuratowicz et al., 2020; Tunstall, 2018). Additionally, the literature presents options that instructors can implement that may improve student achievement (Korth et

al., 2018; Koyuncu, 2020; Pu et al., 2020; Sidelinger & Bolen, 2015; Stanton & Knox, 2018; Usman & Madudili, 2019).

## College Algebra as Part of Core Curriculum

College algebra may be one of the most dreaded classes among all college students; many students see it as a blockade to their college graduation rather than as a pathway to their degree (Altose, 2018; Korth et al., 2018; McKaig, 2018; Rutschow, 2018; Strauss, 2019). Most students are required to pass college algebra, along with other core classes, to earn their associate or bachelor's degree (Blumenthal, 2016; Ganga & Mazzariello, 2018; Korth et al., 2018; Lei & Lei, 2019; Reyes, 2010). Passing a core class typically means earning a grade of C or higher (Fleming, 2019; Saxe & Braddy, 2015; Shakerdge, 2020). There is, however, debate on the effectiveness of the core curriculum that colleges require, including college algebra (Altose, 2018; Blumenthal, 2016; Korth et al., 2018; Lei & Lei, 2019; Rutschow, 2018; Strauss, 2019; Tunstall, 2018).

### *College Algebra is Required*

The College Entrance Examination Board (CEEB) was created in 1899 to ensure there was fairness in deciding who was eligible to enter the top colleges in the country (Phelps, 2018). At that time, mathematics was considered a classical art rather than being part of the science and engineering studies (Tucker, 2013). It was not until the early 1900s that mathematics began being associated with the natural sciences. (Tucker, 2013). Most colleges still had an all-elective curriculum at that time, so many students did not take a mathematics course at all. Even after more colleges began having a core curriculum for all students, the students had the option of taking a science course rather than a mathematics course to fulfill the natural sciences requirement (Tucker, 2013).

After the Sputnik launch in 1957, the CEEB wrote a report that was released in 1959 stating that the college mathematics curriculum needed to be updated to include topics such as linear programming and probability (Furr, 1996); they, along with most Americans, were concerned about the Soviet Union being ahead of the United States in space exploration, and they felt that a more rigorous college mathematics curriculum might help America catch up and pass the Soviet Union (Baker, 2019; Furr, 1996; McAnally, 2019; Taylor, 2017). In the early 1960s, President John F. Kenndy's push to put a man on the moon by the end of the decade caused many more colleges to push for specific mathematical topics to be required, and these topics were mostly covered in college algebra and calculus (Taylor, 2017). After successfully putting a man on the moon, colleges continued to require college algebra, likely due to political motivations rather than for the greater benefit of their students (Taylor, 2017).

The core curriculum that is required for an associate degree or a bachelor's degree at most colleges, no matter which major is chosen, typically includes a certain number of courses in English, mathematics, social science, science, and the humanities (Fleming, 2019; International Bureau of Education, 2022; Lei & Lei, 2019). Most college degree core curriculums have a default of college algebra as the minimum of the mathematics requirements for students (Blumenthal, 2016; Ganga & Mazzariello, 2018), and some post-secondary schools even require their students to take a minimum of two college algebra courses or a college algebra course and a second mathematics course (Burdman, 2013; McGowen, 2017). Some colleges allow their students to choose from a list of classes in each subject area, but college algebra is usually the minimum of the required core curriculum for mathematics at most colleges and universities, no matter their chosen major (Korth et al., 2018; Lei & Lei, 2019; Poliakoff, 2020; Reyes, 2010; Tunstall, 2018).

### *Core Curriculum Effectiveness*

There has been research that has debated whether or not the current core curriculum that is required at most colleges is even effective for students at that level (Blumenthal, 2016; Burdman, 2013; Gilyazova et al., 2020; Korth et al., 2018; Lei & Lei, 2019; Poliakoff, 2020; Rutschow, 2018; Skuratowicz et al., 2020; Tunstall, 2018). One of the reasons college algebra is included in this debate of effectiveness is that college algebra is actually designed to prepare students for calculus rather than preparing them for their future careers and real life (Blumenthal, 2016; Douglas & Attewell, 2017; Ganga & Mazzariello, 2018; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020; Tunstall, 2018). Another reason college algebra is included in this debate is because it also seems to be nothing more than a repeat of algorithms that students were taught in high school, and these algorithms often mean nothing to students (Blumenthal, 2016; Skuratowicz et al., 2020).

Of all the students that do manage to pass college algebra with a grade of C or higher, only about 10 to 15% of them even start a calculus course (Ganga & Mazzariello, 2018; Skuratowicz et al., 2020). No one would suggest that students who are majoring in science, technology, engineering, and mathematics (STEM) fields do not need college algebra and calculus, but critics are beginning to stress that those courses are not important to ensure life success for students who are majoring in other fields such as English, history, and political science (Blumenthal, 2016; Burdman, 2013; Rutschow, 2018; Stewart, 2018). Although many of those who are opposed to not requiring college algebra say that students need the course to develop higher order thinking skills, it is not the only course that teaches those skills (Lynch, 2018). In fact, following Bloom's (1956) Taxonomy of educational objectives, any class can be taught in such a way as to help develop those higher order thinking skills (Aheisibwe et al.,

2021).

It follows, then, that college algebra may not be an effective mathematics course for helping the majority of college students in their careers or in their lives after graduation (Blumenthal, 2016; Douglas & Attewell, 2017; Stewart, 2018; Strauss, 2019; Tunstall, 2018). Although there are many scholars who agree that the college mathematics programs need to be improved, there is still a great deal of disagreement among them about exactly what the problem is and how to fix it (Douglas & Salzman, 2020). Even some scholars who believe college algebra is important for all students to learn think that the current curriculum needs to be overhauled (Devlin, 2017). Many critics of college algebra believe that the solution may begin with a new type of mathematics curriculum (Blumenthal, 2016; Ganga & Mazzariello, 2018).

### *Why College Algebra is Still Required*

There are those who believe college algebra is still a required core curriculum course strictly for political purposes, while others emphasize the profit colleges make by requiring all students to take college algebra (Taylor, 2017). If students are required to take a remedial course or repeat the course due to failure or withdrawal, then colleges make even more money off of it. Additionally, college algebra has a higher enrollment than any other first year mathematics courses below calculus, and a large number of these courses are taught by graduate students or adjunct faculty (Tunstall, 2018); this also increases profits for the school. Some say it is required because it has been that way for years, so no one wants to take the time and energy to change it (Lynch, 2018). Finally, there are some who believe that those who complete a college degree will be better employees, and those who do not complete it are less persistent; in this mindset, it is simply important to have a difficult route to graduation in order to weed out those who are not as resourceful (Douglas & Attewell, 2017).

However, there are those who consider the material college algebra valuable information for all students to learn. Gulick (2012) gives ten reasons why he believes all college students need college algebra; these reasons include learning critical thinking skills, learning problem-solving skills, transferring abstract thinking, fulfilling requirements for some science and other mathematics courses, reinforcing arithmetic skills, learning to communicate with others who talk about mathematics, becoming more comfortable with technical things, opening doors for other disciplines, and keeping college academic standards high. Several professionals hold similar opinions on the importance of learning college algebra no matter what major or career a student chooses to pursue.

The idea that college algebra is needed for students who want or need to take higher mathematics courses is a popular reasoning for why it should still be required (Demme, 2018; Douglas & Salzman, 2020; Gulick, 2012; Stewart & Reeder, 2017; Tunstall, 2018). Other common viewpoints today are that college algebra improves logical thinking and higher order thinking skills, and students should take college algebra in case they have a future career change to a job that requires the knowledge (Demme, 2018; Douglas & Salzman, 2020; Gulick, 2012; Tunstall, 2018). Finally, Demme (2018) also stresses that algebra can be useful in life outside of school and work; for instance, he uses algebra to help make financial decisions, choose a phone plan, and pick a healthcare plan.

**Relationship Between Mathematics and Careers**

As previously noted, there is no doubt that students who are majoring in STEM fields need to take college algebra as a minimum required mathematics course (Istas et al., 2021). However, the number of STEM graduates in the United States has steadily been falling (Stewart & Reeder, 2017), which indicates there is not a need for as many college algebra classes. Data

shows that in 2015-2016, only 18% of the bachelor's degrees awarded were in STEM fields; 82% of bachelor's degrees were awarded in fields not related to STEM (Indicator 26: STEM Degrees, 2019). Furthermore, research has shown that in most jobs, the concepts learned in college algebra are not necessary (Hacker, 2016; Handel, 2016; Loague, 2018; McKaig, 2018; Stewart, 2018). In fact, the mathematics that is used in the workplace is seldom more advanced that the mathematics that is learned in middle school, and many workers need nothing more than skills that include mathematical abilities such as adding and subtracting, counting change, measuring, and estimating (Douglas & Attewell, 2017; Douglas & Salzman, 2020; Hacker, 2016; Handel, 2016).

After investigating the concepts in mathematics that most workers in the United States use, Douglas and Attewell (2017) stated the following:

> Evidently, there is a very strong and long-standing belief among many leading scientists, business leaders, and policy-makers that mathematics is a very important occupational skill, and an area in which U.S. education is deficient. However, there is a disconnect, if not a contradiction, between that belief and evidence from the Bureau of Labor Statistics O*NET program and the OECD data, which assess the skills used by the U.S. workforce. Both document that the numeracy, mathematical reasoning, and mathematical knowledge used by the large majority of employees is very basic. (p. 17)

Out of approximately 123 million workers in the United States, only about 2.6 million, or just over 2%, say that they need to do mathematics as or more advanced than calculating the square footage of a house, and less than 0.1% said they needed to do mathematics as or more advanced than calculating an interest payment (Douglas & Attewell, 2017). As I explore the phenomenon of the experiences English majors have had in college algebra, it will be important to keep in

mind the value, or lack thereof, of college algebra for this group of students.

### *Mathematics for STEM Majors*

There are approximately four times the number of students who are not majoring in STEM fields than those who are; however, about two-thirds of mathematics credits earned among students who graduate with a bachelor's degree are earned by students majoring in STEM fields (Douglas & Salzman, 2020). Among the students majoring in STEM fields, 82% of them take advanced mathematics courses, including calculus, versus only 31% of students who are not majoring in a STEM field, as most STEM majors require these courses (Douglas & Salzman, 2020). STEM students majoring in physical sciences, engineering, and mathematics (PEM) make up 42% of all STEM majors, and they typically take approximately 13.7 advanced mathematics credits; those majoring in biological sciences, computer science, and other STEM fields (BCO) make up 58% of STEM majors and only take about 4.8 advanced mathematics credits (Douglas & Salzman, 2020).

### *Mathematics for Non-STEM Majors*

Approximately two-thirds of workers in non-STEM jobs will use no mathematical concepts more complicated than fractions, decimals, and percentages (Hacker, 2016; Handel, 2016). In addition, only 22% of them will use even the simplest algebra concepts, and those who are using them are mostly skilled trade workers (Hacker, 2016; Handel, 2016). Most incumbent workers do not use any mathematics higher than elementary math (Douglas & Attewell, 2017). However, almost all students majoring in non-STEM fields are required to take college algebra as part of their core curriculum (Blumenthal, 2016; Ganga & Mazzariello, 2018; Lei & Lei, 2019; Poliakoff, 2020; Reyes, 2010).

### *Percent of Students Who Follow the Career Path of Their Majors*

One of the arguments for college algebra mentioned previously is that students often change their major or find a job in a career path in which they did not major; therefore, they may need more mathematics (Demme, 2018; Douglas & Salzman, 2020; Gulick, 2012; Tunstall, 2018). However, statistics show that 35% of college students who originally major in a STEM field change their major to a non-STEM field (National Center for Education Statistics, 2017), but only 5.5% of college students with a non-STEM major switch to a STEM major (National Academy of Engineering and National Research Council, 2012). After graduating, only 28% of students who majored in a STEM field actually worked in a STEM job, and a mere 6% of students with non-STEM majors had a STEM related occupation (Day & Martinez, 2021). Providing students with a mathematics course that they are able to understand and that motivates them is more likely to give them a positive attitude towards mathematics than forcing them to take a college algebra course that they neither understand nor will use, and it may also open doors for them to options for careers they otherwise may not have had or thought about (Skuratowicz et al., 2020).

**Low Student Achievement in College Algebra**

There is a great deal of evidence that shows students' academic achievement in college algebra is very low across all majors (Burdman, 2013; Childers et al., 2021; Ganga & Mazzariello, 2018; Harrell & Lazari, 2020; Lei & Lei, 2019; McKaig, 2018; Pearce et al., 2017; Rutschow, 2018; Skuratowicz et al., 2020; Stewart & Reeder, 2017). Some of this evidence includes the high number of remedial mathematics classes that have had to be implemented by postsecondary schools in an effort to better prepare students for college algebra due to the high failure rate (Childers et al., 2021; Florence & Lin, 2019; McKaig, 2018), and other evidence shows the failure rate of students who are in college algebra, even among those who have taken

these remedial classes (Burdman, 2013; Childers et al., 2021; Florence & Lin, 2019; Rutschow, 2018). Further research indicates that although many schools offer various forms of tutoring, the rate of students earning a grade lower than C or withdrawing from the course (DFW rate) is still higher than almost every other course offered at colleges (Das et al., 2020; Douglas & Salzman, 2020; Florence & Lin, 2019; Kosiol et al., 2019; Melnikova, Long, & Adams, 2020; Shakerdge, 2020; Strauss, 2019). This is a huge problem, because the success or lack of success of students' first college mathematics class is a predictor of whether they will change their major, graduate on time, or drop out of college completely (Harrell & Lazari, 2020); additionally, failure of a course and having to repeat it damages students' confidence and their attitude towards the subject in general (McKaig, 2018).

### *Remedial Classes*

In the past ten years, approximately 30% of students at universities and almost 60% of students at community colleges were required to take remedial classes in mathematics because they did not place directly into college algebra (Florence & Lin, 2019; Ganga & Mazzariello, 2018; Ganga et al., 2019; McKaig, 2018; Pearce et al., 2017); the percentage of students placed in remedial courses is even higher for minorities and first generations students (Skuratowicz et al., 2020). According to Skuratowicz et al. (2020), the number of college students who need mathematics remediation is at a crisis level for universities, and it is a full-blown epidemic at the community college level. The problems associated with the number of remedial mathematics classes being added and the lack of student success in those remedial classes has been a national issue for decades (McAnally, 2019). The increase in the number of remedial mathematics classes having to be offered causes grave concerns, both for the mathematics community and for the country (McGowen, 2017).

Furthermore, the high number of students at community colleges who need remedial mathematics classes, along with the low number of students who actually pass those remedial mathematics classes, makes placement in these remedial classes one of the largest blockades to students finishing their college degree (Burdman, 2013; McKaig, 2018; Rutschow, 2018; Skuratowicz et al., 2020). Rather than being a pathway to their gateway college algebra course, remedial classes are often an additional barrier for students (Childers et al., 2021; Skuratowicz et al., 2020) The way remedial courses were originally designed all too often puts students into an "endless cycle of repeating courses, compounding debt, and not earning college credit" (McAnally, 2019, p. 2).

*Remediation* is a popular buzz word at many colleges, especially in the field of mathematics (Childers et al., 2021; McAnally, 2019). Remediation is defined as activities or programs aimed at helping students with learning difficulties or supporting students that may need to develop better learning skills as well as master content (International Bureau of Education, 2022). One reason remedial classes are so popular is because there is a large number of students who are graduating from high school who are not prepared to enter a college algebra course (Burdman, 2013; Childers et al., 2021; Ganga & Mazzariello, 2018; Harrell & Lazari, 2020; McAnally, 2019; Pearce et al., 2017; Skuratowicz et al., 2020). Placement tests when entering college have become the norm in an attempt to ensure students are placed in the appropriate level mathematics course (Harrell & Lazari, 2020; Lei & Lei, 2019; McAnally, 2019).

Most college administrators believe these placement tests and the remedial mathematics classes in which students are often placed will help students be successful in subsequent mathematics courses (Lei & Lei, 2019; McAnally, 2019). However, research has shown that

although the remedial mathematics classes have increased the number of students who are able to attend college, they do not seem to improve student achievement, nor do they help with student retention (Burdman, 2013; Childers et al., 2021; Douglas & Salzman, 2020; Florence & Lin, 2019; Ganga et al., 2019; McAnally, 2019; Pearce et al., 2017; Rutschow, 2018). The failure of remedial mathematics classes to improve student achievement in college algebra is, in fact, an even larger issue than the number of students who are being placed in those classes (Skuratowicz et al., 2020), as too many of them are getting lost in the "pipeline" (Childers et al., 2021). Some critics argue that it is the fault of the high schools and that they need to do a better job of preparing students for college mathematics, but others are beginning to ask if all students really need the same preparation in college for their careers after graduation (Burdman, 2013; Ganga & Mazzariello, 2018; Rutschow, 2018).

### *College Algebra Failure Rate*

Even with the improved placement tests, the remedial classes that are offered, and the tutoring that is now available to most students, college algebra is still the single most commonly failed class at the community college level (Ganga & Mazzariello, 2018; Skuratowicz et al., 2020; Strauss, 2019). Less than 10 years ago, the three post-secondary classes that had the absolute lowest success rates nationwide were all remedial mathematics courses (Burdman, 2013); to date, developmental mathematics, intermediate algebra, and basic algebra have both the highest failure rates and the highest withdrawal rates of all college classes in the entire nation (Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020). On average, only about 50% of all students who take college algebra in the United States achieve a grade of C or higher in the course, which is required by most schools to continue to the next mathematics course or transfer the credit to another college (Saxe & Braddy, 2015; Shakerdge, 2020). In fact, over half of the

students in the remedial mathematics classes at one state university did not pass the courses (Pearce et al., 2017).

The lack of helpful information for students in college algebra, along with the repetition of information that students have had in high school, they know they will never need or use, and they have trouble grasping, has led to frustration, failure, and withdrawal from the course (Burdman, 2013; Herriott & Dunbar, 2009; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020). Of all the students who are required to take at least one remedial mathematics course first, only 20% go on to pass college algebra. This means that 80% of the students who are placed in remedial mathematics courses will not be able to graduate college and pursue their desired careers, even if they are successful in their other coursework (Burdman, 2013; Rutschow, 2018).

### *Tutoring*

Due to the high DFW rate, many postsecondary schools have begun offering various forms of free tutoring for students who are enrolled in college algebra or remedial mathematics courses, such as web-based online tutoring and in-person peer tutoring (Das et al., 2020; Melnikova, Long, & Adams, 2020; Newell, 2019). Although tutoring has been shown to provide a slight increase in student achievement, it has not been a significant increase. One study showed that there is a positive relationship between tutoring and final grades in college algebra; however, even with bonus points on exams as an incentive, only 57% of students went to tutoring at all during the semester, and half of those only attended once or twice throughout the entire semester (Melnikova, Long, & Adams, 2020). A second study showed that there was no difference in achievement between a traditional college algebra course that had no supplemental instruction and a college algebra course at the same school that included mandatory weekly tutoring

(McKaig, 2018). One reason tutoring may not help increase student achievement more, according to some of the tutors that were surveyed and interviewed, is because many students are not coming to tutoring to understand the material; rather, they are simply wanting to get the answers to their homework (Newell, 2019).

## Increasing Student Achievement

Since all college students are required to take a mathematics course to graduate, and since college algebra, the minimum mathematics course required for most majors, is often failed or causes students to drop out, some colleges have tried to implement programs to help improve student achievement. The literature previously reviewed has discussed three of these things−improved college placement tests to ensure all students are enrolled in appropriate level mathematics courses (Harrell & Lazari, 2020), the addition of remedial classes for students who are not prepared for college algebra (Childers et al., 2021; McKaig, 2018), and various forms of tutoring that are available for all students (Das et al., 2020; McKaig, 2018; Melnikova, Long, & Adams, 2020; Newell, 2019). However, the research of literature that has been presented here has also shown that these methods have not been effective enough to increase student achievement to a satisfactory level; many students are still failing or withdrawing from the courses. Other things that colleges could consider that could possibly help students in college mathematics are efforts to increase motivation, efforts to increase interest in the subject, efforts to increase self-efficacy, and providing courses that are more closely related to students' majors rather than making all students take college algebra.

### *Motivation*

Motivation is an extremely important part of student achievement (Atkinson, 1964; Bandura, 1986), especially in mathematics (McKaig, 2018; Tempelaar et al., 2018; Xu, 2018).

Motivation, or the lack thereof, is the single greatest predictor of whether a student will be successful in a class, fail it (Broadbent, 2016), or drop out of it (Schnettler et al., 2020). One reason motivated students are more likely to be successful than less motivated students is because they are much more likely to ask their instructor for help when they do not understand something (Pöysä et al., 2019). Another reason motivated students are more likely to be successful, specifically in mathematics, is because motivated students are more likely to do homework than students who are less motivated, and this improves their understanding of the material (Xu, 2018). Multiple studies have shown that there is a direct correlation between students who are unmotivated and low academic achievement (Crawford-Garrett, 2018; García Gutiérrez & Durán Narváez, 2017; McKaig, 2018).

College instructors can increase academic achievement among their students by increasing student motivation; it has been determined that when instructors regularly, intentionally engage their students, it increases student motivation and, therefore, student achievement (Newell, 2019; Pu et al., 2020; Sidelinger & Bolen, 2015; Stanton & Knox, 2018; Usman & Madudili, 2019). Additionally, instructors who make it a point to be engaging in their classrooms have a higher retention rate among their students than those who do not (Keller & Johnson, 2019). Studies have shown that even something as small as a nudge−a little change that gently encourages people towards something that will ideally help them−can make a huge impact on students (Niederjohn & Holder, 2019; Tempelaar et al., 2018). One nudge that instructors can give their students is encouragement to form a support group; students who have support groups of study partners, parents, mentors, or instructors have been shown to have higher motivation (White et al., 2017). Another nudge is to encourage students to work together, as this can be another step in scaffolding, which has been shown to improve understanding (Bandura, 1986;

Brower et al., 2018). As instructors work to increase motivation among their students, they also can increase student achievement in their classes (Broadbent, 2016; McKaig, 2018; Tempelaar et al., 2018).

Motivation is especially vital in the field of mathematics. One study showed with reliability co-efficients of 0.89 and 0.92 in a test and retest that motivation does improve the achievement of students in mathematics (Adamma et al., 2018). Another study showed an effect size of .54 for intrinsic motivation and .30 for extrinsic motivation on student achievement (Herges et al., 2017). Intrinsic motivation is the volition to engage in a task for inherent satisfaction (Ng, 2018); in other words, there is no physical reward, but the student has a desire and drive to complete the task. Extrinsic motivation is behaviors done for reasons other than their inherent satisfactions (Ryan & Deci, 2020); some examples of extrinsic motivators are good grades, parental praise, and winning competition prizes. Finally, a third study showed a positive r-value of 0.697 of the relationship between motivation and success in mathematics (Jufrida et al., 2019). For all students, but especially for those who place in remedial mathematics courses, an engaging curriculum and instructor can help them be successful (Burdman, 2013; Skuratowicz et al., 2020). These studies show the necessity of encouraging motivation in mathematics courses.

Instructors can increase motivation in mathematics by being engaging (Cheon & Reeve, 2015). Instructors can engage their students by asking questions, prompting discussions, using technology, using curriculum-appropriate games, letting students work together on problems or projects, giving feedback quickly, or even walking around the room while talking (Cheon & Reeve, 2015; Sidelinger & Bolen, 2015; Wu et al., 2020). When students are engaged and motivated, they are much more likely to ask for help when they do not understand something

(Pöysä et al., 2019). By purposefully engaging their students, mathematics instructors can motivate their students and increase student success in their classes (Sidelinger & Bolen, 2015; Stanton & Knox, 2018).

***Interest***

Another factor that has a high impact on student achievement is interest in a subject (Geisler & Rolka, 2021; Kosiol et al., 2019; Koyuncu, 2020; Rach & Heinze, 2017; Skuratowicz et al., 2020). When students are bored in a course, they have lower academic achievement in it (Tempelaar et al., 2018). When students are interested in the contents of their program, they are more likely to have study satisfaction and to stay in college; when they are less interested in their courses, they are at a higher risk of withdrawing from the course or dropping out of college (Geisler & Rolka, 2021; Kosiol et al., 2019; Skuratowicz et al., 2020). One reason for this is because when students are interested in a course or subject, they are more likely to participate in learning activities for that course such as attending and paying attention in class, doing assigned homework, and studying for tests (Yu & Singh, 2018). In order for students to be successful in their college academics, including their college mathematics course, their individual characteristics, such as what they learned in high school and their interests, must fit with the learning environment characteristics, such as the learning opportunities provided to them (Geisler & Rolka, 2021; Rach & Heinze, 2017).

One crucial factor to the learning environment in a classroom is having an instructor who is actively engaged with his or her students (Usman & Madudili, 2019). Instructors who do nothing but lecture the entire time during every class have less interest among their students and lower student achievement than instructors who make it a point to involve the students in their daily lessons (Keller & Johnson, 2019; Sidelinger & Bolen, 2015). Students learn better when

they are using prior knowledge and applying it and asking questions than when they are simply listening to a lecture (Krouss & Lesseig, 2020). Additionally, allowing students to work on assignments together in groups has been shown to increase both student interest and academic achievement (Wilson et al., 2018). Finally, another option that has helped students stay interested and engaged in a class is changing up the teaching style from day to day (Roop et al., 2018). Instructors who implement these suggestions will reduce boredom in the classroom, and this helps to keep students more interested in the material that is being taught (Keller & Johnson, 2019; Pöysä et al., 2019; Roop et al., 2018; Sidelinger & Bolen, 2015). This, in turn, will increase students' achievement in the course (Kosiol et al., 2019; Rach & Heinze, 2017; Skuratowicz et al., 2020).

Some other ways instructors can increase student interest in mathematics are by incorporating technology in the course, encouraging interaction among students, and building competition into their classes (White et al., 2017). Additionally, models that contain social issues and concepts or epidemiology data have been shown to create interest among students (Okonkwo, 2017). Furthermore, mathematics instructors who make their lessons more relevant and engaging to their students rather than lecture the entire class time have students who are more interested in learning the material (Sidelinger & Bolen, 2015). Changing the way that a class is taught requires more work than planning lectures, but instructors need to make sure they consider the goals of the course and the attributes of their students (Krouss & Lesseig, 2020). Instructors also need to show students belief in their abilities, concern about things that matter to them, support, and respect (Yu & Singh, 2018); the possible benefits for the achievement and retention of students make it worth the effort.

***Self-efficacy Increase and Anxiety Reduction***

A third factor that can assist in increasing student achievement is improving self-efficacy among students. Bandura's (1986) social cognitive theory speaks to this (Eun, 2019; McAnally, 2019), as well as Atkinson's (1964) expectancy- value theory, and many other studies have shown that self-efficacy is a strong predictor of student success (Eun, 2019; Koyuncu, 2020; Krouss & Lesseig, 2020; McAnally, 2019; Núñez-Peña & Bono, 2019; Xu, 2018; Yu & Singh, 2018). In other words, students need to believe that they are capable of doing the work in a course in order to be successful. When people, including students, have higher self-efficacy, they are more motivated to learn and to complete the tasks at hand (Bandura, 1986; Eun, 2019; McAnally, 2019), which then increases achievement (McAnally, 2019; Tempelaar et al., 2018; Xu, 2018).

If instructors encourage their students and show that they believe in their students' abilities, it could increase their students' self-efficacy. Crawford-Garrett (2018) found that encouraging resilience among students also helps increase self-efficacy; this means focusing on the students' capacity to do well rather than their past failures. If students think they are going to fail, they often quit trying; teaching students resilience helps them continue to put in the work to try to pass the course, even when the material gets difficult (Crawford-Garrett, 2018). Furthermore, when instructors encourage students and tell them they are able to learn the material, students are more likely to internalize those beliefs and have greater self-efficacy (Yu & Singh, 2018).

In addition to motivation and self-efficacy, emotions are a major factor in students' academic achievement (Tempelaar et al., 2018; Xu, 2018; Yu & Singh, 2018). Emotion regulation can particularly affect students' performance on homework (Xu, 2018). Therefore, it is vital to learn which emotional factors affect student achievement the most (Núñez-Peña &

Bono, 2019). Mathematics anxiety is one of several emotional factors that can reduce students' self-efficacy (Koyuncu, 2020; Melnikova, Long, & Stocker, 2020; Núñez-Peña & Bono, 2019; Skuratowicz et al., 2020; Xu, 2018), which literature presented here has shown can reduce students' achievement.

Mathematics anxiety is a real thing with many causes (Núñez-Peña & Bono, 2020; Zamora-Lobato et al., 2019), and students who have it are less likely to be successful in their mathematics classes (Barroso et al., 2021; Koyuncu, 2020; Núñez-Peña & Bono, 2019; Skuratowicz et al., 2020). In fact, the Organization for Economic Cooperation and Development's Programme for International Student Assessment (OECD: PISA) (2012) estimates that students' grades in mathematics courses drop as much as 14% when they have anxiety about mathematics. One reason mathematics anxiety causes students to have lower academic achievement is because the worry they are experiencing about doing poorly uses up part of the brain's limited working memory, and they do not have enough resources left to do the mathematics (Núñez-Peña & Bono, 2020).

One study showed that every one-point increase on the test anxiety section of a student's Motivated Strategies for Learning Questionnaire (MSLQ) during a semester will indicate a decrease in his or her final college algebra grade of 0.21 to 6.81 percentage points (Melnikova, Long, & Stocker, 2020); this same study showed that students who ultimately failed the course had had more worry and an increase in their concern about their performance as the semester progressed. Other studies have shown that among students who are failing their college algebra course, their self-efficacy decreases and their anxiety increases as they continue through semester, and this causes them to feel like they are less able to be successful in the course (Melnikova, Long, & Stocker, 2020; Rach & Heinze, 2017). Until there is a solution to this

prodigious problem of anxiety, student interest and motivation will continue to decrease, and so will students' academic achievement in the course (Ay Emanet & Kezer, 2021).

As instructors help students become more confident in their abilities, their self-efficacy gets stronger, and their anxiety lessens (Barroso et al., 2021; McAnally, 2019; Zamora-Lobato et al., 2019). This can lead to higher student academic achievement and lower withdrawal rates (Skuratowicz et al., 2020). Furthermore, instructor support, including positive encouragement and feedback, has been shown to promote a significant increase in student achievement (McAnally, 2019; Pöysä et al., 2019; Yu & Singh, 2018). Finally, mathematics instructors need to get past the idea that if a student gets an answer correct, that means they understand the material; instructors need to focus more on the students than the material and teach the *why* as well as the *how* if they truly want to see improvement in student achievement (McGowen, 2017; Newell, 2019).

### *Benefits of Mathematics for Specific Majors*

Although algebra provides the basic foundation for higher mathematics courses, such as calculus, it has been shown to be unnecessary for most people in their everyday lives (Strauss, 2019). The mathematics course that most college students are required to take, namely college algebra, typically has nothing at all to do with their future career choices if they are not pursuing a career in a STEM field such as engineering or mathematics (Altose, 2018; Blumenthal, 2016; Burdman, 2013; Long, 2016). Scholars are encouraging colleges to teach meaningful mathematics courses that will benefit students in their lives and future careers rather than concepts they will never use (Altose, 2018; Blumenthal, 2016; Douglas & Salzman, 2020; Long, 2016; Skuratowicz et al., 2020).

In an effort to improve student motivation, interest, and self-efficacy, there are some

institutions that have implemented changes to their mathematics curriculum; these changes are allowing students to take mathematics courses that are dependent on their courses of study rather than having all students take the minimum of college algebra (Blumenthal, 2016; Burdman, 2013; Ganga & Mazzariello, 2018; Rutschow, 2018). These new curriculum tracks being offered by some colleges are often called math pathways, and they offer students different mathematics courses that are dependent on their majors (Blumenthal, 2016; Ganga & Mazzariello, 2018; Rutschow, 2018). Some of them provide options that focus on statistics or quantitative reasoning rather than concepts that mainly benefit students going into calculus or other higher mathematics courses (Blumenthal, 2016; Ganga & Mazzariello, 2018; Rutschow, 2018). Many of these new programs have been shown to be very successful in improving student interest, student motivation, and student achievement in their mathematics courses (Ganga & Mazzariello, 2018; Rutschow, 2018).

Ganga and Mazzariello (2018) reviewed three of the math pathways options; they are the Dana Center Mathematics Pathways (DCMP), Carnegie Math Pathways, and math pathways developed by the California Acceleration Project (CAP). The DCMP model was first introduced at nine colleges in Texas in the 2013-2014 school year (Ganga & Mazzariello, 2018). The Center for the Analysis of Postsecondary Readiness (CAPR), which studies developments education reforms at colleges, looked at the results from four of the Texas schools; they found that after three semesters, the students who had participated in the DCMP model were almost 50 percent more likely to have passed a college-level mathematics course than the students who had taken other developmental courses (Ganga & Mazzariello, 2018). In 2015, Arkansas created the Arkansas Math Pathways Task Force (AMPT) and adopted the DCMP model (Korth et al., 2018). The model was first implemented at two four-year universities and one two-year college;

the results were so successful that the AMPT decided to implement the DCMP model statewide (Korth et al., 2018). Their recommendation after seeing the higher success rate is that any student who does not need calculus should not take college algebra, but they should take a math pathway course instead (Korth et al., 2018).

Carnegie Math Pathways was implemented in 29 colleges in 2010 and 2011 (Altose, 2018; Ganga & Mazzariello, 2018; Huang, 2018). They have two options, Statway and Quantway (Ganga & Mazzariello, 2018). Statway was originally offered only as a yearlong statistics course that included support for students who needed developmental mathematics; now it is also offered as a single term accelerated course (Ganga & Mazzariello, 2018). Quantway was originally offered only as a two-semester, quantitative reasoning course with the first semester being a developmental level course and the second being a college level course; now it is also offered as a yearlong course or a single term course with support integrated into it (Ganga & Mazzariello, 2018).

The Quantway curriculum has been a game changer for many students (Altose, 2018). Altose (2018) noted that at Cuyahoga, 75% of the students in the Quantway program passed in the 2015-2016 school year, while only 29% of students nationally in traditional developmental courses passed. He also stated that Cuyahoga often has a 100% retention rate in the course. Huang (2018) noted a study by WestEd that showed a much higher percentage of students in Statway completed their college level mathematics course within one year than students in the traditional mathematics sequence.

Statway has also been successful in helping many students (Long, 2016; Norman et al., 2018). Statway was introduced in 19 colleges in Washington after all 34 community and technical colleges were involved in changing the way they approached math (Long, 2016). At

Seattle Central, 84 percent of students passed the three-class series of Statway the third year it was offered, as compared to 11 to 15 percent of students in other remedial classes (Long, 2016). A more recent quasi-experimental design study compared students in Statway to similar students who were in developmental courses other than Statway, and they found that those in Statway were much more likely to earn a degree (Norman et al., 2018).

The CAP pathway was founded in 2010 by two community college teachers who were concerned about the high number of DFW students in remedial mathematics and English courses (California Acceleration Project, 2022). It was designed for students who were placed in a developmental course, and it was introduced in 2011; the pathway helps colleges replace multiple levels of coursework with only one or two courses (Ganga & Mazzariello, 2018). Rather than have students take separate developmental courses over several semesters, CAP recommends having them take college-level math pathways courses that have a corequisite support paired with it (Ganga & Mazzariello, 2018). During the 2011 school year, students in the CAP program were four and a half times more likely to successfully complete a college level mathematics course than those who took the traditional developmental mathematics course (Ganga & Mazzariello, 2018).

For schools that have a broader view of what should be the true purpose of education—to prepare students for life after college—it is time for them to focus on the individual student needs rather than a generic curriculum (Strauss, 2019); the utmost goal of education needs to be effective learning for all of the students in attendance at the school (Eun, 2019), and this includes learning mathematical concepts that will benefit students in their careers and their lives after graduation from college. Colleges and universities need to focus on teaching their students the concepts in mathematics that will be useful for them in their everyday lives and their careers

rather than wasting their time on a generic college algebra course that offers nothing of value to them (Blumenthal, 2016; Skuratowicz et al., 2020). Prioritizing students' needs in their mathematics courses can help to give them the best opportunity for success both in college and in life after graduation (Altose, 2018).

## Summary

When planning a study about the experiences that English majors have had in college algebra, it was important to research the mathematics courses that would be best for college students to take and that would help them be the most successful; therefore, it was critical to keep in mind that Bandura's (1986) social cognitive theory stresses modeling and scaffolding as effective teaching methods, as well as the importance of self-efficacy. Students need to see examples of what to do, they need guidance through the process of learning, and they need to feel confident in their abilities to learn the material. In addition, it is also vital to remember that Atkinson's (1964) expectancy-value theory also stresses self-efficacy, and it also emphasizes people's willingness to attempt things when they expect a valuable outcome, as well as their reluctance to attempt things if they do not expect a valuable outcome. These theories made up the framework for the research to understand the experiences English majors have had in college algebra. Furthermore, the research discusses what course students believe would be the most likely to help them be successful—a traditional college algebra course or a mathematics course that is specific to their major. Additionally, the theories guided the research to determine whether English majors feel that college algebra has a more valuable outcome than a major-specific course.

The literature presented here shows that there are many factors that affect student success and retention in college. These factors include having college algebra as part of the core

curriculum, the low achievement in college algebra, and the different ways to increase student achievement in college mathematics. However, there was a gap in the literature on research to determine if students majoring in English feel that they would be better off taking a mathematics course that is more specific to their major rather than a generic algebra course that every student takes, regardless of his or her major.

# CHAPTER THREE: METHODS

## Overview

The purpose of this qualitative phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. The hermeneutical approach was appropriate for this study because it seeks to discover the essence of the lived experiences of a group of people, and the researcher was aware of biases (Guillen, 2019; van Manen, 1997, 2014). This chapter identifies the research questions, the setting and participants, and the researcher's role. To best understand the experiences that English majors have had in college algebra, data was collected first by recruiting participants via a survey to get descriptive data in order to have purposeful sampling, which was then followed by semi-structured interviews, journal prompts, and focus groups. The researcher was a participant observer. Data was analyzed as it was collected, using van Manen's (1997, 2014) steps of analysis. Finally, the trustworthiness of the study is addressed.

## Research Design

To learn more about the experiences that English majors have had in their college algebra courses, a qualitative study was appropriate. The qualitative approach was appropriate because the study was being conducted in order to learn about experiences through in-depth, personal life stories of participants (Creswell & Poth, 2018). Furthermore, as this study was researching a particular phenomenon, a phenomenological study was appropriate (Creswell & Poth, 2018). The researcher recognized that personal biases exist, so a hermeneutical approach was the specific phenomenological study design (Guillen, 2019). This design is based on theories by Max van Manen and Martin Heidegger. In his writings, van Manen (2014) defines hermeneutic phenomenology as "a method of abstemious reflection on the basic structures of the lived

experience of human existence," (p. 26).

Phenomenology began as a philosophy founded by Edmund Husserl (1936/1970), who became interested in it while studying for his PhD at the University of Vienna in the early 1880s. Husserl's beginning works are based on transcendental phenomena. In 1936, Husserl wrote *The Crisis of the European Sciences*, in which he showed a turn away from transcendental and towards "prereflective lifeworld of everyday experience," (van Manen, 2014, p. 105). Heidegger studied philosophy, including Husserl's works, at the University of Heidelberg in the early 1910s. He took this approach farther and employed phenomenology from an ontological approach. Heidegger is credited with beginning the movement towards hermeneutical phenomenology (George, 2020). van Manen studied the works of Husserl and Heidegger, as well as others, and has further developed the hermeneutical approach (van Manen, 2014). Using van Manen's methods, this qualitative hermeneutical phenomenological study helped to understand the experiences of college algebra among English majors.

## Research Questions

To understand the phenomenon of college algebra among English majors, there was a central research question and three sub-questions that I was seeking to answer. The questions were formulated to fully understand the essence of the phenomenon. The following questions, based on the current literature, guided this study.

### Central Research Question

What are the experiences of college students majoring in English in their required college algebra course?

### Sub-Question One

What expected benefits do English majors believe they will receive in their field of study from their required college algebra course?

**Sub-Question Two**

What course content would English majors like to see included in their required college algebra course or as an alternative to college algebra for their undergraduate core mathematics curriculum?

**Sub-Question Three**

What mathematics abilities do English majors feel they need to learn in order to do their expected future jobs?

## Setting and Participants

The research for this study was done at a college in the southeastern United States. This site was chosen due to its proximity to me, because it made it convenient for me to meet with students for interviews and focus groups. Also, the school has a wide variety of students who attend, so I was able to ensure various ages, races, and types of students were included in the study. Additionally, this level of students was chosen because the study required that the students were majoring in English and had taken a college algebra course.

### Site

The study was done at a college I will call Thomas University in the southeastern United States. This school was chosen because there is a wide demographic of students. The demographics are as follows: 79% are undergraduate students, and 21% are graduate students; 69% are full time, and 31% are part time; 61% are female, and 39% are male; 73% are White, 13% are Black or African-American, 3% are Hispanic, 2% are Asian, 1% are American Indian or Native American, less than 1% are Native Hawaiian or Other Pacific Highlander, 3% are two or

more, 1% are unknown, and 4% declined to say; 2% are under 18, 19% are 18-19, 26% are 20-21, 23% are 22-24, 11% are 25-29, 6% are 30-34, 5% are 35-39, 6% are 40-49, and 2% are over 50 (Data USA, 2019). The school is an established public college that follows federal guidelines in leadership structure. There is a Board of Trustees that has governing control, and it is established by the State Legislature. The Governor is president ex officio of the board, and there are ten members; six of the members are from the area, three are from elsewhere in the state, and one at-large member can be from within the state or outside of the state. The chief officer of administration is the President of the University. Under the President is an administrative staff, faculty, and various committees. Each college at the University has a dean, and each department has a chair. The school offers a variety of mathematics courses, and it requires college algebra or math reasoning for the arts as a minimum core mathematics requirement for English majors. It should be noted that math reasoning for the arts is a course that may not transfer for general education credit.

**Participants**

In qualitative research, participants need to be chosen through purposeful sampling in order to fully understand the central phenomenon (Creswell & Guetterman, 2019). For this study, participants were recruited from Thomas University by use of an identifying survey. Participants were all at least 18 years old, and all had taken college algebra and were able to help understand the phenomenon of the experiences they had had in that college algebra course as English majors. Creswell and Poth (2018) recommend five to 25 participants in a qualitative study; more specifically, for a phenomenology, Creswell and Poth (2018) recommend limiting the participants to 10 to 15. Therefore, participants for this study included 12 college students majoring in English in at least their second year of their program. It was important to have

enough participants to fully understand the phenomenon, but it was not necessary to keep adding participants once saturation occurred (Creswell & Poth, 2018).

## Researcher Positionality

In qualitative research, the researcher declares their positionality in regard to the research. This section will explain my phenomenological reflection as it pertains to this study. I conducted this study because I am a college mathematics instructor with over 25 years of experience and a heart for students. From personal observation as a college mathematics instructor at several post-secondary schools, I have seen the college algebra requirement as a minimum for my students in almost every major at many community colleges and universities; this requirement includes students seeking both associate degrees and bachelor's degrees. The most common question I hear is, "Why do I have to learn this?" Over the years, I have seen students fail college algebra, even though they were very smart and excelled in their other courses. The desire to understand this phenomenon and positively impact students and professors prompted me to undertake this study. I used a social constructivism framework, and the philosophical assumptions that guided the study were ontological, epistemological, and axiological.

### Interpretive Framework

I used a social constructivism framework for conducting this study. In social constructivism, a person is searching for understanding in the world around them, specifically where they live and work (Creswell & Poth, 2018). Years of teaching college algebra has given me a unique perspective of the struggles students, especially English majors, have in the course. Seeking the complexity of the views of English majors who have taken college mathematics through a social constructivism framework aided in my interpretation of the study. Throughout my study, I wanted to learn about the experiences that English majors have had in their college

algebra course. Additionally, Schunk (2020) says that the social constructivism approach has a concentration on social interactions and sociocultural factors. I understand that the participants were coming from a variety of backgrounds, and those backgrounds may have an effect on their experiences with mathematics. I hoped to find some common threads among some of the participants and to determine the essence of their experiences with college algebra.

## Philosophical Assumptions

All humans have assumptions and biases, and those assumptions and biases can influence our research (Creswell & Poth, 2018). Therefore, it was necessary for the researcher to be aware of what assumptions and biases exist in order to keep them from influencing the data or how it is analyzed. The three philosophical assumptions that were addressed in the study are ontological, epistemological, and axiological.

### *Ontological Assumption*

The ontological assumption I brought to this study is that there is not one universal reality; however, I was also aware that there are others who do not share my belief. Although I did not share my belief with my participants, it was important that I was aware of it. Through the interviews, journal prompts, and focus groups, I was learning about each participant's reality of their experience with mathematics. Believing that each person possibly has a different reality, I tried to understand each of them and search for common themes (Creswell & Poth, 2018).

### *Epistemological Assumption*

With an epistemological assumption, a researcher tries to get as close to the participants as possible (Creswell & Poth, 2018). My epistemological assumption was coming from the fact that I am a college mathematics instructor. I believe that knowledge is constructed through both doing and seeing, and I was attempting to construct knowledge about this phenomenon by

getting a complete understanding of the participants' experiences. I believe that a person's background and effort both affect the amount of knowledge a person will gain. I attempted to close the gap between myself and the participants in order to fully understand the phenomenon being studied by spending time with them, listening to them, and encouraging them to share their experiences.

### *Axiological Assumption*

The axiological assumption I brought into this study was that mathematics is important for every college student, but college algebra may not be the best mathematics course for English majors. Thus, it was necessary for me to ensure the participants had taken college algebra, and then I wanted to understand their experiences with it. I was aware that I value mathematics as an important part of every student's education, and I was also aware that I am biased against every student taking college algebra. I feel that college algebra does not prepare the majority of students for real life, and I believe there should be mathematics classes that are designed for different majors rather than a single class for all students. I think most students do not appreciate having to take college algebra, and I also think that most students would have a better experience in a mathematics class designed for their majors. However, I determined to be honest with the results, and if participants have had positive experiences with college algebra, I vowed to report that accurately and I was open to a correction in my assumption.

## Researcher's Role

As a qualitative researcher, I am aware that I am a human instrument in my study (Creswell & Poth, 2018). Instruments are the tools used to do research; in qualitative research, the researcher is a tool (Creswell & Poth, 2018). During this research, I interviewed college students. I conducted the interviews and focus groups at the university where I taught, but I

excluded any students who had ever been in my classes. I had no authority or influence over any of the students that were involved in the study. I recognized that I do have a bias regarding required mathematics courses; I did not feel that all college students should be required to take college algebra. These biases are part of the reason why I specifically chose English as the major for my phenomenological study; I knew from personal experience that English majors tend to struggle more in college algebra than some other students. I acknowledged my biases and was aware of them so that they did not influence the data I collected nor how I analyzed the data.

## Procedures

When IRB approval was obtained, I emailed the head of the English department at Thomas University and requested a list of students majoring in English. I then sent out a survey to those students asking if they would be willing to participate in my research, and I included a questionnaire for those who were willing to participate to learn more about each person. Using that questionnaire, I selected 12 students taking careful consideration to ensure a diverse demographic of students. It was important to have a representative sample to ensure generalization (Smith, 2018). I began my research by interviewing the participants individually, and I transcribed the interviews and looked for emerging themes. After the interviews, I gave the participants a list of journal prompts to complete and bring with them to the focus group or return digitally. I then scheduled two focus groups of four students, and I arranged those meetings at a private room in the campus library; those who could not come in person joined via Zoom. At the beginning of the focus groups, I reminded those joining virtually who had not returned journal prompts to email them as soon as possible; those joining in person had all returned their journal prompts. After the focus groups had been transcribed and compared to the interviews and journal prompts, I sent the transcriptions to the participants for member-checking.

Using the data from the interviews, the journal prompts, and the focus groups, I triangulated the data to determine the essences of the experiences.

**Permissions**

Before any contact of participants or beginning of data collection, permissions and approvals were obtained. Permission was obtained from Thomas University for use of the site and students. IRB approval was determined to not be needed from Thomas University. Finally, IRB approval was obtained from Liberty University prior to any research being started. A copy of the IRB approval letter from Liberty University is included in Appendix E.

**Recruitment Plan**

The participants were students at a college I will call Thomas University. There were about 130 students majoring in English at Thomas University at the time research began, and about 55 students were minoring in English. I spoke to the chair of the English department to explain my research, and she agreed to give me a list of all students majoring in English. I emailed all of the English majors a questionnaire. Purposeful sampling, which means a researcher deliberately chooses participants (Creswell & Poth, 2018), was used. This was important, because it was necessary to "intentionally sample a group of people that can best inform the researcher about the research problem under examination," (Creswell & Poth, 2018, p. 148). I chose participants who were English majors, who had taken college algebra, who were at least in their second year of the program, and who were willing to participate in all three forms of data collection. All participants received information explaining the study, and informed consent was received before the research proceeded. A copy of the participant consent form is included in Appendix D. No participant received any type of incentive for his or her participation in the research.

## Data Collection Plan

I used participant interviews, journal prompts, and focus groups to collect rich, in-depth data for my research study. According to Creswell and Poth (2018), qualitative studies must include a triangulation of data. These forms of data collection allowed the participants to fully share their experiences in college algebra. Furthermore, it allowed me to get a full understanding of those experiences. I began by talking to the students individually to get a full understanding of the phenomenon. There were also journal prompts for the students and focus groups with them to discuss the findings and dig deeper into the phenomenon. The interviews and focus groups each lasted about half an hour. I gathered information, transcribed the interviews using a voice to print software, and analyzed the interviews to determine if I needed to develop follow-up questions. All interview questions are listed in Appendix A. Journal prompts are listed in Appendix B, and focus group questions are listed in Appendix C. As the data were analyzed, further questions would have been developed as needed, and participants would have been asked to participate in a follow-up interview; however, this was not necessary.

### Individual Interviews

The first data collection strategy I used was individual interviews. According to Brinkmann and Kvale (2015), interviews are where "knowledge is constructed in the interaction between the interviewer and the interviewee" (p. 4). In other words, during an interview, information is passed back and forth, and knowledge is gained. Interviews were appropriate for my study, because I was trying to gain knowledge about an experience that I have not had. van Manen (1997) notes that interviews can be used to gain a richer, deeper understanding of a phenomenon. Interviews were conducted privately, either in a private area on campus or via videoconferencing. All interviews were audio recorded. I used a semi-structured strategy with a

planned 11 open-ended questions that are broad and allowed the participants to expound on their experiences, and the interviews lasted approximately half an hour. I then transcribed the interviews using a voice to print software. It was my goal to have all of the research questions answered to some degree during the interview process. A sample of Laura's interview is included in Appendix F.

***Individual Interview Questions***

1. Please describe your social and educational background through your high school graduation. CRQ
2. What were your experiences in your college algebra course? CRQ
3. Describe what you learned in your college algebra course that you feel was beneficial. SQ1
4. What did you learn in your college algebra course that has helped you as an English major? SQ1
5. What else would you like to add to our discussion of your experiences in college algebra that we have not discussed? SQ1
6. Describe options to college algebra that would transfer as a general education requirement, if any, you would like to see available for English majors as a mathematics course. SQ2
7. If you could create a mathematics course specifically for English majors, what would it look like? SQ2
8. What else would you like to add to our discussion about options for an undergraduate mathematics course for English majors? SQ2

9. What mathematics abilities do you think you will need in order to do your future job well? SQ3
10. Describe the challenges you have when trying to do mathematics that you think you will need in your future job. SQ3
11. What else would you like to add to our discussion about the mathematics abilities you think you will need to be able to do your job well? SQ3

The questions listed here begin with a grand tour question (Creswell & Poth, 2018). They then move through the central research question and sub-questions. These questions were reviewed by experts in the field prior to ensure quality interviews.

***Individual Interview Data Analysis Plan***

The data obtained in the interviews were analyzed using van Manen's (1997, 2006) six steps to analysis. As this was a hermeneutical phenomenological study, and as he is the founder of hermeneutical phenomenology, his method was appropriate for analyzing the interview data for this study. The interviews were transcribed verbatim using a voice to print software prior to the analysis, and I reviewed the transcriptions while relistening to the audio to ensure accuracy and to make any corrections that were needed. Following van Manen's (1997, 2006) method of data analysis, I first focused on the nature of lived experience and investigated the experience as it was lived by listening and recording interviews. I then reflected on the essential themes that emerged while transcribing the interviews. Next, I described the phenomenon through writing and rewriting; I reviewed the interviews and edited the writings as needed. Throughout this process, I maintained a relation to the phenomenon, and I balanced the research context by considering both the parts and the whole. This data was then synthesized and triangulated with the data I collected from the journal prompts and the focus groups.

## Journal Prompts

The second form of data collection I used was journal prompts. Journal prompts are a form of document analysis, which is "a form of qualitative research that uses a systematic procedure to analyze documentary evidence and answer specific research questions," (Frey, 2018, p. 544). Journal prompts are statements used to provoke thought and give a person an idea of something about which to write. Journal prompts are appropriate for a phenomenological study because they complement interviews, and they can give the researcher a deeper, more reflective understanding of the experiences that the participants have gone through (Creswell & Poth, 2018; van Manen, 2014). Journal prompts were given to the participants at the end of their interviews if they were conducted in person, and they were emailed to the participants at the end of their interviews if they were conducted via Zoom. Participants were asked to return them either digitally or when they came to the focus group. There were three prompts, and participants were asked to complete them with at least two paragraphs. Participants had two weeks to complete their journal prompts. A copy of Autumn's journal prompts is included in Appendix H, and a copy of Nita's is included in Appendix H.

### *Journal Prompts*

Complete the following journal prompts with at least two paragraphs. Each paragraph should contain at least three sentences. Please return them via email within two weeks or bring them to the focus group meeting.

1. "My best experience in my college algebra course was ..." CRQ
2. "My biggest challenge in my college algebra course was ..." CRQ
3. "If I were to design a required college mathematics course for English majors, it would include _____, and it would not include _____. " SQ2 and SQ3

**Journal Prompts Data Analysis Plan**

The data obtained in the journal prompts was also analyzed using van Manen's six steps to analysis. Following van Manen's (1997, 2006) method of data analysis, the journal prompts focused on the nature of lived experience. As I read them, I investigated the experience as it was lived. I reflected on the essential themes that emerged from the responses. I then described the phenomenon through writing and rewriting, and I edited what I had written as I went back over the prompts. Through this process, I maintained a relation to the phenomenon, and I balanced the research context by considering both the parts and the whole. This data was then synthesized and triangulated with the data collected from the interviews and the focus groups.

**Focus Groups**

The third form of data collection I used is focus groups. Focus groups are a form of interviews. Focus groups were similar to personal interviews in that the participants were asked a series of questions; however, they were different because there were multiple participants that were answering the questions together and talking about the issues among themselves (Creswell & Poth, 2018). Focus groups are helpful when interaction among participants will help produce valuable information, when participants have similarities, when time is limited, and when participants may be shy about talking one-on-one with the researcher (Gill & Baillie, 2018; Marques et al., 2021). The focus groups were held in a private room at the library at Thomas University, and those who could not come joined via Zoom. All focus groups were audio recorded. I also took notes during the focus group to ensure an accurate transcription. There were two focus groups with four people in each group, and one group with three people; Creswell and Guetterman (2019) suggest having focus groups of four to six people. There were six question prompts to begin the discussions during the focus groups, and all participants were encouraged to

take part in the discussion. The focus groups lasted just over half an hour. These focus groups helped me uncover more about the experiences the participants have had.

**Focus Group Questions**

1. Can you describe any specific times in your college algebra courses when you were excited to be learning a concept? SQ1
2. Can you describe any specific times in your college algebra courses when you were frustrated about learning a concept? SQ1
3. Can you explain your opinions on the idea of having some other mathematics course that could be tailored to be more applicable for English majors? SQ2
4. What mathematical concepts from your college algebra courses do you feel confident you will use in your jobs? SQ3
5. What mathematical concepts do you feel that you will need in your future jobs that were not taught in college algebra? SQ3
6. Do you know of any struggles that any other English majors have had in their college algebra courses? SQ1

***Focus Group Data Analysis Plan***

The data obtained in the focus groups was also analyzed using van Manen's six steps to analysis. The focus groups were transcribed verbatim using a voice to print software prior to the analysis. I reviewed the transcriptions while relistening to the audio to ensure accuracy and to make any corrections that were needed. Following van Manen's (1997, 2006) method of data analysis, I focused on the nature of lived experience and investigated the experience as it was lived as I reviewed the transcriptions of the focus groups. I reflected on the essential themes that emerged during the analysis. I then described the phenomenon through writing and rewriting,

reviewing the transcriptions as I edited the writings. I maintained a relation to the phenomenon and balanced the research context by considering both the parts and the whole. This data was then synthesized and triangulated with the data collected from the interviews and the journal prompts.

### Data Synthesis

After analyzing all of the data, I found common themes among the information gained in the three method collections. I used the Atlas.ti software program to aid in identifying themes. According to van Manen (1997), the theme is the point, or the capturing, of the phenomenon. Using van Manen's (1997) thematic analysis method, after determining the themes that emerged, I developed textural and structural descriptions of the participant experiences. I then provided details from the research to support those themes and coded it into categories as described by Creswell and Poth (2018). Finally, I blended it together to write a cohesive, composite description that reports the essence of the phenomenon.

## Trustworthiness

Lincoln and Guba (1985) stress the importance of trustworthiness in a research study. There is no point in doing a study if readers cannot have confidence in the results. Therefore, I have taken measures recommended by Lincoln and Guba (1985) to establish credibility, transferability, dependability, and confirmability. This section is devoted to assuring the readers of the quality of this qualitative study.

### Credibility

Credibility is confidence in the *truth* of a study's findings or the extent to which the findings accurately describe reality (Lincoln & Guba, 1985). This means the reader can be confident that the researcher reported the truth, to the best of his or her abilities. In order to

establish credibility, I used triangulation and member checking, as suggested by Cohen and Crabtree (2006). I was also open and transparent in my writing to clarify my biases (Creswell & Poth, 2018) to show that they did not skew the data in any way.

### *Triangulation*

In this study, one method I used to establish credibility is triangulation of interviews, journal prompts, and focus groups. This means I used multiple data collection methods and compared them to ensure a theme exists rather than forcing them to say what I want (Creswell & Poth, 2018). This was done to explore the experiences of English majors in their undergraduate college mathematics courses. The data was analyzed individually, and then it was synthesized to create a cohesive writing of the essence of their experiences.

### *Member Checking*

Another method I used to establish credibility is member checking. This means I allowed the participants to read my transcriptions for accuracy (Rossman & Rallis, 2016). As a college mathematics instructor, I have had discussions with many students about their experiences. Additionally, I have had conversations with instructors of other subjects about mathematics courses. This allowed me to have an insider's, or *emic* perspective; according to Rossman and Rallis (2016), this was an advantage for me, because it allowed me to understand the participant's perspectives as I reflected on former conversations. To continue establishing credibility using member checking, I provided all participants with a copy of the transcription of their interviews and focus groups to review for accuracy.

## Transferability

Conditions for transferability were created. Details are given of the participants, the site, and the procedures that were used for the study. The study can be replicated for majors other

than English, and curriculum developers can also use it to create new mathematics courses. If more information about the study is needed by anyone who wishes to replicate it, I am willing to provide it while still ensuring participant confidentiality. Findings of this study are described using thick descriptions (Creswell & Poth, 2018) to ensure conditions are favorable for transferability.

## Dependability

Dependability for this study was established as required through an inquiry audit. My dissertation committee and the Qualitative Research Director at Liberty University conducted a thorough review of the study's process and products to ensure dependability. This study showed that the results are consistent and that the study could be repeated. Additionally, rich, thick descriptions (Creswell & Poth, 2018) were used to further ensure dependability.

## Confirmability

Throughout this study, I have admitted my biases, and I am aware of them and my motivation for the study. The works presented here are the experiences of the participants as told by the participants. To establish confirmability, I used member checking, as recommended by Creswell and Poth (2018), triangulation, as previously discussed, and reflexivity, as recommended by Weis and Fine (2000).

### *Triangulation*

I have discussed using triangulation to establish credibility, but I also used it to establish confirmability. Again, triangulation of interviews, journal prompts, and focus groups to explore the experiences that English majors have had in their college algebra courses were used. The data was analyzed individually, and then it was synthesized to create a cohesive writing of the essence of their experiences.

### *Reflexivity*

I am aware of my biases; however, I did not allow them to influence the data I collected or the way I analyzed the data. I followed the advice of Weis and Fine (2000) and ensured that I did not allow myself to become passive. I remained vigilant and did not separate my responsibility as a researcher from my personal interpretations. I only used the data that I collected from the participants, and I did not allow my personal feelings to cloud my research.

## Ethical Considerations

Permission was obtained from Thomas University for the use of their site and students. Following approval of site and student use, IRB approval was obtained from Liberty University, and it was determined that IRB approval was not needed from Thomas University. After purposeful sampling occurred, informed consent was obtained from each participant before any research began; each participant was made fully aware that participation was voluntary and that they could withdraw from the study at any time. Participants were all at least 18 years old. Confidentiality of the site and the participants was protected through the use of pseudonyms, and all information is stored in a locked file cabinet and on a computer that is password protected. Any and all data will be destroyed after three years. Risks and benefits to the participants were stated clearly and completely. No students who had ever been enrolled in one of my courses were allowed to participate.

## Summary

The problem was most students are required to take college algebra (Ganga & Mazzariello, 2018), even though it is unnecessary for their careers (Burdman, 2013), approximately half of them are failing the course (Ganga & Mazzariello, 2018; Shakerdge, 2020; Strauss, 2019), and many are unable to complete college because they cannot pass the required

college algebra course (Burdman, 2013; Melnikova, Long, & Stocker, 2020). The purpose of this hermeneutical phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. I used a hermeneutical approach because I sought to discover the essence of the lived experiences of a group of people and because I was aware of biases. This chapter identified the research questions, the setting and participants, and my role as a researcher. The chapter explained how data was collected from participants who were recruited via purposeful sampling. It further expounded on the data collection methods of semi-structured interviews, journal prompts, and focus groups. A description was then given of how the data was analyzed as it was collected, using van Manen's (1997, 2014) steps of analysis, and how it was synthesized through triangulation. This research took place at Thomas University after approval was obtained from them to use their site and students and after IRB approval was obtained from Liberty University. Measures were taken to ensure participants understood that participation was voluntary and that they could withdraw consent at any time, and participant confidentiality was protected. Additionally, trustworthiness was established through credibility, triangulation, member checking, transferability, dependability, and confirmability.

# CHAPTER FOUR: FINDINGS

## Overview

The purpose of this study was to explore the experiences of students who are majoring in English in their college algebra courses. This chapter begins with descriptions of the participants. Next, the themes that emerged from the data are presented. Following that, the responses to the research questions are given. Finally, the chapter ends with a concise summary.

## Participants

The 12 participants for this study ranged in age from 19 to 54. There were eight female participants and four male participants. Seven participants were undergraduate students, and five were graduate students. There was one Afro-Latino student, one Hispanic and White student, one Black student, and nine White students.

The first four participants responded to the email that was sent to all English majors, and the next five responded to the second email that was sent. The last three participants were found through snowball sampling; that is some of the participants told other English majors about the research, and they contacted me to become part of the study. Table 1 gives a breakdown of the student participants including their age, classification, and specific major.

Table 1

*Student Participants*

| Student Participant | Age | Classification | Major |
|---|---|---|---|
| Autumn | 20 | Junior | Secondary English Education/Language Arts |
| Elsie | 20 | Junior | Secondary Education - English |
| Gracy | 20 | Junior | English: Professional Writing |
| Jake | 24 | Graduate Student | English - Writing |
| Laura | 19 | Sophomore | Secondary English Education |
| Linda | 20 | Junior | English |
| Lisa | 22 | Senior | English & Professional Writing |
| Marie | 21 | Graduate Student | Kinesiology with (7-12) English Endorsement |
| Myles | 42 | Graduate Student | English & Technical Writing |
| Nita | 23 | Senior | English: English Literature and Professional Writing |
| Scott | 54 | Graduate Student | English - Writing |
| Zack | 45 | Graduate Student | English: Technical Writing |

**Autumn**

Autumn is a 20-year-old junior majoring in English: secondary education. She took college algebra as a dual credit course while she was still in high school. Autumn started college majoring in psychology. However, due to her struggles in college algebra, she changed her major

so that she would not have to take another mathematics course. Autumn said that she was overwhelmed trying to understand the material before it would be time for another test. She does not think she will need any of the concepts that were discussed in the course in her future job as an English teacher.

**Elsie**

Elsie is a 20-year-old junior majoring in English: secondary education. Elsie took college algebra during the first semester of her freshman year. She told me that her biggest struggle in the course was motivation. She said that everything in the course was the same as the things she had done in high school, and she knew that she did not need any of the information for her future career. She shared with me that as an English teacher, she does not feel like she will need to do much mathematics; she said that with the technological advances we have now, there is computer software to do all of her final grade calculations. Elsie said she wished she could have taken a mathematics course that touched on things like grading and statistics, but also included personal finance concepts.

**Gracy**

Gracy is a 20-year-old student majoring in English: professional writing; Gracy is also a junior. They took college algebra as a dual enrollment course while still in high school. They began their college journey majoring in social work, but they changed to English their freshman year. Gracy wants to be a professional writer, and they also want to start their own bakery. Gracy's situation is unique, because they know they will need some math in one area of their career, but they also feel like they will not need any in the other area. However, they do not feel like they learned anything in college algebra that will help in either business. Gracy would have preferred a course that taught more practical and financial mathematics concepts.

**Jake**

Jake is a 24-year-old graduate student working on his master's degree in English: writing. Jake earned his undergraduate degree in Spanish after changing his major from computer science. He changed his major specifically so he would not have to take another mathematics course. He said he felt overwhelmed by the fast pace of the course and the amount of irrelevant material in it. Jake wished his college mathematics course had included more financial planning concepts.

**Laura**

Laura is a sophomore majoring in English: secondary education. She is 19 years old. Laura took college algebra her freshman year in college; she said she was grateful for her low C in the class simply because it meant she would not have to repeat it. She said that she had entered the course with a positive attitude, but she could not understand the material or keep up with the fast pace. She said she cried on a regular basis trying to do the homework, and she felt like it was a complete waste of her time and money. Laura said the course was completely irrelevant to her future career and that she did not learn anything that would help in her job or in her life.

**Linda**

Linda is a 20-year-old junior majoring in English. Linda has always gravitated towards English, and she was nervous about her college algebra course. She said that the class took up 75% of her time studying, and she also had to hire a private tutor. Linda said the course was "truly useless" towards her degree, and it was a burden for her both financially and mentally. She said the only math she could think of that any English major might need is how to read statistics while doing research, and she felt that college algebra was the most stressful course any English major had to take.

**Lisa**

Lisa is a senior majoring in English and professional writing, and she is 22 years old. She said the only reason she passed college algebra was because her professor gave several extra credit opportunities. She said that her professor was very helpful, but the course was still a struggle. Lisa told me, "The fact that my entire college rested on how well I could graph equations was daunting," and passing the course was a huge weight off her. She said that having a mathematics course that included more arts-based information and less science-based information would be much better for students majoring in English.

**Marie**

Marie is 21 years old and is a graduate student majoring in English. She took her college algebra course as a dual enrollment course while still in high school. Marie said that she is one of the few English majors that is also good in mathematics, but she still felt like the course was unnecessary for her career. Additionally, she said the amount of homework required in the course was overwhelming at times while also taking other classes. Marie said a better option for English majors would be something that had more statistics and real-world problem solving.

**Myles**

Myles is a 42-year-old graduate student working on his master's degree in English and technical writing. He said that his college algebra course was nothing more than "a necessary evil." He was frustrated by having to give up a "precious college course block for a class that I knew I would not learn from, but only complete." Myles called his college algebra course a missed opportunity because he felt that the time and money spent there could have been much better used somewhere else. He suggested having a mathematics course that reads more like a novel for English majors, and he even mentioned learning about the history of mathematics.

**Nita**

Nita is a senior who is 23 years old, and she is majoring in English: English literature and professional writing. Nita said she was frustrated in her college algebra course, because she knew that as soon as she finished, she would immediately lose all of the information she had studied. She said that the concepts were not going to be used in her field of study. Nita suggested that a better option for English majors would be a mathematics course that was rooted in the arts and that taught with words rather than numbers.

**Scott**

Scott is a 54-year-old graduate student majoring in English. Scott grew up outside of the United States, and he always struggled with mathematics; he said he preferred music, English and computer courses. Scott said being from another country gives him a different perspective, and he suggested a mathematics course that teaches real-world applications like conversions. Students majoring in English that are considering journalism may have to travel, so that would be beneficial to them. Aside from that, he also suggested introductory statistics and financial concepts for a mathematics course.

**Zack**

Zack is a graduate student majoring in English: writing, and he is 45 years old. Zack said that he was terrified to take college algebra, so he put it off until his senior year. However, he also said that he went into the course with the mindset that he was ready to actually learn the material. He said that his biggest frustration in college algebra was that it all seemed like "plug and play" information. He said it was full of formulas that they had to plug numbers into, but no one could ever tell him why or how it could be useful. Additionally, he said there was not one concept in the course that he felt was significant or helpful to him as an English major.

## Results

This study helped me understand the lived experiences of English majors in their college algebra courses. My analysis of the data led me to three themes, two of which have sub-themes. The students I spoke with indicated that they did not have good experiences in college algebra, and they took the course for no reason other than to check it off the list of requirements. The majority of students also wished they had had a different option for a mathematics course that would have applied more to their daily lives and jobs rather than only discussing formulas and graphs. Finally, most of the students did not feel like they would need any of the mathematics concepts from college algebra in their lives or careers, and they said that there was nothing in the course that applied to them. These themes and sub-themes will be discussed below.

### Just Checking Boxes

The students majoring in English that I spoke with had poor experiences in their college algebra courses. They viewed the class as nothing more than a hurdle they had to jump in order to achieve their goal. Six of the 12 participants said that they only took the class to complete the required credit. Laura told me, "I took that course just to check it off the box. So, like, for me, I just became frustrated a lot because I'm like, 'Why do I need to learn this? This is not going to help me anyway.'" She said that she has never really liked the idea that "C's get degrees," but in this class, she was very happy with her C. In his personal interview, Myles said, "There just didn't feel like there was any learning going on. Like, I feel like I was just, like, checking boxes." In his focus group with Elsie, Gracy, and Marie, they agreed with him. Gracy pointed out that they did not have time to actually learn anything, because the course moved too quickly; they said that in their class, there was rampant cheating just to get through the course. Elsie said

that she didn't cheat, but she did not learn anything, either. She said, "I knew I did not need the material for my job, so I just wanted to get through the class for the credit I had to have."

### *Frustrations*

In almost every personal interview, I kept hearing the words "frustrated" and "frustrating." In fact, 10 of the 12 participants used some form of the word "frustrate" in their interview and/or their journal prompts. Students I spoke with said that their college algebra courses were more of the same struggles they had experienced in high school. They did not understand why they were having to sit through a class that was not only a repeat of something they struggled with in high school but also had nothing to do with their future careers. Lisa said, "It was frustrating to constantly go over the material, watch lectures, read the textbook, reach out for help, but have none of that work." Myles wrote that his best experience in college algebra was "learning I had passed it and would not ever need another math class." He told me in his interview that he usually loves learning, but college algebra was nothing but frustrating. Nita said, "There was a lot of practice and a lot of frustration … It was all just incredibly frustrating for me." Autumn elaborated in her interview, "The material was so frustrating. I passed with a 72, because it was that hard for me. I cried every day in there."

### *A Waste of Time and Money*

Data analysis shows that the participants did not feel like they were gaining anything of value. Of the 12 participants, five mentioned independently that the course was a waste of their time and/or money; the same subject was also brought up in all three focus groups, and all 11 of the participants in the focus groups agreed. Most of their college algebra courses had copious amounts of homework, which took time away from their coursework that related to their major. Additionally, it was an added cost that they did not feel like they should have to pay for. Nita

said that she was “frustrated because I was spending my money on something that was not going to benefit me. Not long term, right? You know, tuition, the cost of classes, the cost of the books, the access codes for the math classes.” In the first focus group, Gracy said, “I’m having to pay for college myself, you know, and I really didn’t appreciate having to waste my time and money on a class that has nothing to do with what I’m going to be doing in my job!” Elsie, Myles, and Marie agreed with them. Elsie said, “That’s exactly it. College is so expensive already. Like, just teach us what we need to know to do our jobs.” In the second focus group with Jake, Laura, Lisa, and Nita, the same phrase was mentioned; Laura said that a mathematics course tailored to English majors “would be so much more beneficial, and not such a waste of time and our money!” Lisa said, “I think that’s definitely something that needs to happen!” Jake and Nita agreed with them, and then Laura pointed out that college algebra is great for STEM majors, but “it isn’t anything we need.”

### Something Besides Formulas and Graphs

All 12 participants told me that they wished there was a math class that taught them more about things they could use in their lives and in their careers, rather than trigonometric functions and graphing skills that they know they will never need. The most common concepts they mentioned that they wanted were practical mathematics, finances, and statistics. Marie commented, “I believe that real-world problem solving can be a cross-curricular skill used in both math and English courses.”

#### *A Course with Practical Mathematics*

Participants told me they want a math course that teaches them things that can help them in their daily lives. They all agreed that college algebra did not teach them anything that benefits them practically. When asked about what options she would like to see, Laura said, “Just a basic

math refresher, you know? Just things that you could possibly use in everyday life." In the first focus group, Marie mentioned that many of the students in her class did not know how to do basic addition and subtraction without a calculator, and Elsie said that is something she struggles with, as well. Myles added,

> Once you get into middle school, from there forward, it's all formulas and plugging in numbers and using a calculator to get the answer. You know? We never actually *do* math again, so we forget *how* to do math. A class that reminded us how to do basic math work, now that would be fantastic!

When I asked opinions on math courses tailored to be more applicable to English majors in the last focus group with Zack, Linda and Autumn, Zack said, "As English majors, we need math. Just basic math. Nothing else, like, not college algebra."

***A Course with Finances***

The students in this study also revealed they would like a math course that teaches them about personal finance. This was another topic that all 12 participants mentioned. Most of them told me that they do not know how to file taxes, balance a checkbook, or even figure up a tip. In their focus group, Gracy told me, "I didn't learn anything for the real world. I don't know how to do my taxes. I don't know how to balance a checkbook. I don't know how to make, like, a budget for myself. We need something like that." Myles, Elsie, and Marie all nodded and agreed with them, and Elsie excitedly said, "Yes! Exactly that! If a course like that existed, I would take that right now!"

***A Course with Statistics***

Eight out of the 12 students I spoke with said they would also like a math course that teaches them basic statistics. As English majors, these participants feel like they will need to

interpret data at some point, figure percentages for grading, or compile research data. Elsie told me that it is important to know your audience when you write. She said, “How much of your audience is reading this? Should you include this much of this subject? If half your audience wants it this way and 10% wants that, I mean, there’s like weighing of statistics in some way.” Linda mentioned, “I don’t think I would want a whole class on just statistics, you know? But a class that includes some of the basics we might need.” Marie mentioned that some basic statistics would be good to know, “just to make sure when you put grades in the computer, if something is off, you know, you recognize that the grade doesn’t make sense.” Scott said, “As a graduate student, doing research, you know, I wish I could have had a class that taught me more about statistics. And a lot of English majors … do a lot of research.”

**“There is Nothing for Me”**

Out of the 12 participants I spoke with, 11 of them said that there were no concepts in their college algebra course that they would use in their future careers. Only Marie said that the class helped her learn how to analyze data. She compared analyzing problems in college algebra to analyzing poetry or a literary work. However, other than that, she agreed with the other 11 who complained that the things they were being forced to learn had nothing to do with their majors. Autumn said, “There was so much homework, it forced me to manage my time better. But, like, other than that, like material wise, it really did nothing for my career. That’s just the sad truth.” Laura said in her focus group, “Like, I’m going to be an English teacher. I don’t really need to teach them math.” Nita agreed and added, “Yeah! I’m going more the writing route. It’s like, I’m using words, not numbers.” Jake told me in his personal interview, “I think this is great work. Because it is something that I know a lot of students struggle with. In my profession, I don’t do anything with algebra; there was nothing in the course that helped me.”

## Research Question Responses

Participants majoring in English were very willing to share their experiences in college algebra, which provided in-depth answers to my research questions. In the initial interviews, most students were less talkative, but very adamant, about their experiences. I had to encourage them to expound on many of their answers. As I expected from English majors, 11 of the 12 sent very well-written journal prompts; only one was shorter and less thought out. I asked him to expound on his answers, and he sent me a more detailed follow-up. The focus groups were very interesting, and the students fed off each other. When one student brought up a point, the others would pick up on it and add to it. This variety of the types of data allowed me to better understand their experiences in the course, and it gave me a fuller understanding of their thoughts about their classes. The data was very consistent among all 12 participants, and it gave me insight into the essence of their experiences.

### Central Research Question

What are the experiences of college students majoring in English in their required college algebra course? All of the participants indicated that the experience was frustrating, and 10 of the 12 used some form the word “frustrate” in their interview and/or in their journal prompts. This was before they had participated in the focus groups, where one of the questions asked about a specific time they were frustrated to be learning a concept. While in the focus groups, that question was the one all three groups spent the most time on. The average time spent discussing the other five questions was 6 minutes and 21 seconds. The average time spent on that question was 8 minutes and 29 seconds.

Participants did not understand why they had to take the class, they did not feel like the class benefited them in any way, and they felt like the course was a waste of time and money. In

the third focus group, Linda said, “Frankly, no math feels necessary for English majors!” Zack and Autumn agreed with her, and Zack responded, “It was a waste of time I could have used for other classes that would have been more helpful.” Autumn said, “Same! I took it because I had to, but I kept thinking, ‘Why am I here? This is just a waste.” Linda added, “Not to mention the money it cost for not only the class, but the book and access code!”

**Sub-Question One**

What expected benefits do English majors believe they will receive in their field of study from their required college algebra course? The short answer is none. When pressed, some of them said they learned time management, perseverance, or how to ask for help. Myles said that it would help him connect to students who do not like English. He told me, “It will help me resonate with the students who do not want to be in the English class, because, you know, I’ve been there, and that’s who I was.” However, 11 of the 12 said there was not even one actual mathematical concept in college algebra that would benefit them in their future careers.

Scott told me that he has the benefit of knowing that there were no concepts in math that would benefit in his career, because he is already working in his career; he has come back to school as a graduate student, and he had to think long and hard to remember much about his college algebra course. However, there was one thing he was certain of: “There was nothing in there I needed for my job, because I don’t do anything with any kind of math.”

**Sub-Question Two**

What course content would English majors like to see included in their required college algebra course or as an alternative to college algebra for their undergraduate core mathematics curriculum? When asked about an alternative course, 100% of the participants agreed that it would be beneficial to have an option for a mathematics course other than college algebra. They

all agreed that students majoring in English would prefer being able to take a class that teaches life skills such as practical mathematics, personal finance, and statistics.

Linda suggested a course that offered "the barebone basics of what you need for grading and enough statistics to help when you're bringing in sources." Elsie mentioned that she would like a math class that could help her in everyday life. For instance, "When I'm shopping, like, if I could know if my bill is about what it should be. Like, help me figure out sales prices and add up in my head what all I've got." Scott simply said, "We need to just go back to the basics of math and numbers."

Jake wrote in his journal prompts that he would design a course that "would include mathematics for financial planning." Nita wrote in hers, "Taxes, bills, budgeting – these are all thing that we are ill-prepared for throughout college and going into the workforce." Myles told me, "I wish I had learned more about financial stuff, you know, instead of having to figure it all out on my own after I got out of college, so, yeah, I would put that in there."

Marie thought it would be beneficial to have a course with basic statistics so they could learn how to "analyze data and … appropriately measure student progress/achievement." Scott continued with his thought of going back to the basics, "Students need to learn basic statistics. How to do percentages and interpret numbers." Linda said she did not think they needed an entire class just on statistics, but one that included a section on "how to incorporate them within literature."

**Sub-Question Three**

What mathematics abilities do English majors feel they need to learn in order to do their expected future jobs? The theme of participants said college algebra concepts are not used in

their careers was a clear answer to this question. Most participants feel like everything they will need to do that is math-related will be done through computer software.

Linda said, “In this day and age, very few, due to computer generated grading processes. Everything can be done by computer. So truly, I don’t think I’ll need any math by the time I get my degree.” Marie told me,

> Everything is so, like, focused on technology, and I’m able to just input numbers, you know, into our gradebook. And, like, when it comes to percentages and scoring, I can just say, ‘This is how many points I want this out of,’ right? ‘Now. Figure it out for me.’

Elsie said that she thought she would need to know some math for grading purposes, but she is currently in a class where they are talking about grading systems, and “it’s all on the computer! Like, I don’t have to do anything but put the grades in the right spot.”

## Summary

English majors who participated in this study are very vocal about their experiences in their college algebra courses. The data showed that the participants did not have good experiences, they wished they had had a different option for a mathematics course, and they did not feel like they would need any of the mathematics concepts from college algebra in their lives or careers. The first main theme that emerged was just checking boxes, with subthemes frustrating and a waste of time and money. The second theme was something besides formulas and graphs, with subthemes a course with practical math, a course with finances, and a course with statistics. The third theme was “there is nothing for me.” These three themes answered the research questions about their experiences with college algebra, the benefits or challenges of college algebra, their ideas about what mathematics content would be better incorporated, and

the role of math in their future careers. These students would like to see a mathematics course available that offered more practical mathematics skills for English majors.

# CHAPTER FIVE: CONCLUSION

## Overview

The purpose of this hermeneutical phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. The researcher was seeking to learn the benefits of college algebra for students majoring in English, the mathematical content English majors would like to see included in college algebra, and the mathematics abilities English majors feel they will need to know to be successful in their expected future jobs. This final chapter will discuss the interpretation of my findings, the implications for policy and practice, the theoretical and methodological implications, the limitations and delimitations, and recommendations for future research.

## Discussion

The purpose of this study was to explore the experiences of students who are majoring in English in their college algebra courses. The literature review indicated that most students would not have had a good experience and that the participants in this study would feel like it was unnecessary for their future jobs. I found that expectation to be accurate when I spoke with students at Thomas University.

### Interpretation of Findings

The data showed that all 12 of the participants majoring in English had poor experiences in college algebra. Eleven of the 12 said that there were no concepts taught in the course that would be useful for their daily lives or their future careers; one participant said that there was only one useful concept. Additionally, they all desired a different option for a mathematics course that would both meet the requirement for their degrees and also apply to their future lives and careers.

### *Summary of Thematic Findings*

Study participants were eager to tell me about their experiences in their college algebra courses. The resulting themes from analysis of the data showed that participants did not have good experiences in the college algebra courses, they did not learn anything helpful for their lives or their future careers, and they would have liked a different option. Students I spoke with indicated that they wanted to take a mathematics course, but they wanted it to include information that was more practical and useful to them.

**Poor Experiences.** All 12 participants in this study indicated that they had at least some frustration in the course, and 10 of them used some variation of the word "frustrate" during the data collection process. While one student, Marie, said that the course helped her learn how to analyze data, she also said that the course as a whole was stressful for her. Zack's self-efficacy was so low, he told me he put the course off until his senior year. Laura, Nita, Zack, Linda, Gracy, Elsie, Scott, Lisa, Jake, and Myles all said that they were anxious about their college algebra course, and they all said that they struggled in it. This data reinforces the literature and the guiding theories of the study.

According to the literature, the lack of helpful information for students in college algebra, along with the repetition of information that students have had in high school, information they know they will never need or use, and that they have trouble grasping, has led to frustration, failure, and withdrawal from the course (Burdman, 2013; Herriott & Dunbar, 2009; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020). Self-efficacy is one of the most important parts of both of the theories guiding this study—the social cognitive theory and the expectancy-value theory (Abdullah et al., 2020; Atkinson, 1964; Bandura, 1986; Eun, 2019; Griffin et al., 2020; McAnally, 2019; Melnikova, Long, & Stocker, 2020; Stewart et al., 2020). This means

that people must believe they are capable of success before they are willing to try something new, especially if they perceive the new task as challenging (Bandura, 1986; Eun, 2019; McAnally, 2019; Schunk, 2020; Stewart et al., 2020). If they do not believe that they will be successful, the fear of failure or embarrassment will prevent them from even attempting the task (Atkinson, 1964; Griffin et al., 2020; Schunk, 2020). This lack of self-efficacy may be one reason many students are becoming frustrated, failing, and withdrawing from the course (Burdman, 2013; Herriott & Dunbar, 2009; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020).

**Useless.** During the literature review, I learned that college algebra is actually designed to prepare students for calculus rather than preparing them for their future careers and real life (Blumenthal, 2016; Douglas & Attewell, 2017; Ganga & Mazzariello, 2018; Melnikova, Long, & Stocker, 2020; Skuratowicz et al., 2020; Tunstall, 2018). Furthermore, the research of the literature has also shown that in most jobs, the concepts learned in college algebra are not necessary (Hacker, 2016; Handel, 2016; Loague, 2018; McKaig, 2018; Stewart, 2018). Approximately two-thirds of workers in non-STEM jobs will use no mathematical concepts more complicated than fractions, decimals, and percentages (Hacker, 2016; Handel, 2016). Part of Bandura's (1986) social cognitive theory involves the perception of the transferability of a new skill to other areas of a person's life. If students majoring in English do not feel they can use college algebra in their careers, they may be less willing to learn it. Atkinson's (1964) expectancy-value theory also involves students' motivation to learn new things being positively or negatively affected by what they believe they will receive in return for their success or failure (Atkinson, 1964; Schunk, 2020). If they do not feel that the class will benefit them, they may be less motivated to put in the work required to be successful in it.

The data acquired in this study is aligned with the literature and with both theories guiding the study. Again, Marie was the only participant who said that there was a single concept in the course she felt she could apply to her career. The remaining 11 participants all said that there was not even one thing in the course they could use in their future jobs. When asked what she learned in college algebra that would benefit her in her career, Nita sat and thought about the question for almost a full minute before responding, “I really am so sorry, and I hate to say it, but I really can’t think of anything.” Zack said, “I don’t, I mean, I literally don’t think anything at all.” Linda simply answered, “Nothing. And I don’t say that just to sound negative. It’s just that we don’t use math. At all.”

**Options are Nice.** The review of the literature showed that college algebra may not be an effective mathematics course for helping the majority of college students in their careers or in their lives after graduation (Blumenthal, 2016; Douglas & Attewell, 2017; Stewart, 2018; Strauss, 2019; Tunstall, 2018). There is a great deal of disagreement among critics about exactly what the problem is and how to fix it (Douglas & Salzman, 2020), but many of them believe that the solution may begin with a new type of mathematics curriculum (Blumenthal, 2016; Ganga & Mazzariello, 2018). One of the main focuses of the social cognitive theory is modeling (Abdullah et al., 2020; Bandura, 1986; Belland et al., 2020; Schunk, 2020). However, if there are no concepts in college algebra that students majoring in English can use, there is nothing to model. Furthermore, considering Atkinson’s (1964) expectancy-value theory, students may feel that a major-specific mathematics course might be more valuable to them than college algebra.

Analyzing the data, I found that all 12 participants would have preferred a mathematics course that contained information they could have applied to everyday lives, as well as their future careers. Autumn said in her focus group, “I think this would be beneficial and help to

create more respect for both fields." Nita said a mathematics course rooted in the arts would be helpful, one that took more of a "language-based approach … in communication with words as opposed to numbers." She also pointed out in her focus group that there are options for every other subject, but not for math. Nita shared,

> I had the option of taking world history or U.S. History, options for electives, options for my science course, options for humanities, even options for my English courses! But I didn't have an option for math; I had to take college algebra.

Lisa, Laura, and Jake all agreed with her and said that they had experienced the same situation. They were able to choose courses in every other subject area, but they were required to take college algebra.

Lisa also used the phrase "focused on the arts" and said that combining mathematics with something they are familiar with could help them grasp some of the concepts. Specifically, she said this could be done "by applying math to different types of literature or publications or looking at some statistics to better prepare students for their future fields." Myles suggested a mathematics course that included the history or philosophy of math and questions such as, "What is a number?" All 12 participants said they would like personal finance to be a part of a mathematics course for English majors. Autumn summed up her journal prompts with the statement, "Ultimately, I would try to design a mathematics course that would not intimidate English majors just by reading its title."

**Implications for Policy or Practice**

College students majoring in English could benefit from the option of taking a major-specific mathematics course rather than college algebra. This section will offer ways colleges could tailor their core mathematics course offerings to possibly improve achievement in

mathematics among students majoring in English. Additionally, it will offer ways current college algebra professors could tailor their classes to benefit all students.

### *Implications for Policy*

If Thomas University truly desires to meet the needs of all students majoring in English, they should consider offering a mathematics course other than college algebra that would meet the mathematics requirement for their major. Students have options for other fields of study, they should also have options for their mathematics courses. One option would be the math pathways that was discussed earlier, as they are different mathematics courses designed for students in different majors (Blumenthal, 2016; Ganga & Mazzariello, 2018). Many of these new programs have been shown to be very successful in improving student interest, student motivation, and student achievement in their mathematics courses (Ganga & Mazzariello, 2018; Rutschow, 2018). There are many changes that are required in order to implement math pathways at colleges, and research has to support a need for it before those changes can even begin (Ganga & Mazzariello, 2018). The data from this study has shown that there could be a need for this option at Thomas University for their students majoring in English. If this group of students were to benefit from the math pathways option, it may also be a beneficial option for students majoring in other non-STEM fields.

Furthermore, the Arkansas Math Pathways Task Force recommendation, after seeing the higher success rate in some of their schools where math pathways were implemented, is that any student who does not need calculus should not take college algebra, but they should take a math pathway course instead (Korth et al., 2018). If Thomas University implemented math pathways and saw improvement among their students, it would add to the research of other schools such as those in Arkansas. Seeing the improved achievement among many different schools in different

parts of the country could demonstrate a need for a nationwide change in the way mathematics courses are offered at the college level. Those who choose the curriculum and the courses at all colleges should consider the findings of this study and others that have shown college algebra is not the best option for non-STEM students.

Additionally, until there are options to college algebra for students, curriculum creators need to reconsider the concepts that are included in college algebra. Concepts that are specific to students moving into calculus, such as transformations of the graphs of functions, could be replaced by concepts that would benefit a larger range of students, such as personal finance topics and basic statistics. This would be beneficial to all students.

### *Implications for Practice*

As long as Thomas University is going to continue to require all English students to take college algebra, the professors can make changes to the way they teach in order to improve student achievement in those college algebra courses. Although professors are not allowed to leave out topics that are required in the current college algebra curriculum, they can help students through those difficult topics. Bandura's (1986) social cognitive theory and Atkinson's (1964) expectancy-value theory both included the concept of self-efficacy. While many students majoring in English may have low self-efficacy coming into the course, professors can use motivation to improve their self-efficacy using positive reinforcement (Schunk, 2020). Additionally, if teachers encourage students and show that they believe in their students' abilities, the students will have more self-efficacy and will be more willing to try to learn something new (Schunk, 2020). This study was done at Thomas University, and it only involved students majoring in English, but the social cognitive theory and expectancy-value theory have indicated that this encouragement from professors could help students at all schools and in all

majors.

The professors can also try to find ways to implement some of the topics that would benefit all students on days that that have extra time. Additionally, if they are able to finish the required work a few days early in the semester, they could add those topics at the end. Professors can give assignments in a variety of ways, and they can also vary the content of the assignments to better reach most students. Finally, the mathematics professors could petition the head of the department to encourage him or her to change the course offerings, the curriculum, or the topics that they are required to cover in their college algebra courses.

Students can find ways to improve their achievement in their mathematics course, as well. In addition to finding extra help if they are required to take college algebra, they can talk with their professors in both the English department and the mathematics department. They can explain their concerns and encourage them to help affect change. They can also speak with their college algebra teacher and ask them to please use more arts-based examples instead of science-based examples, to incorporate personal finance examples where they can, and to include some basic statistics if they have extra time.

**Theoretical and Empirical Implications**

This study has both theoretical and empirical implications. Theoretically, the data from this study builds on the social cognitive theory and the expectancy-value theory and will add to the body of literature about them. One of the things the social cognitive theory focuses on is self-efficacy, (Abdullah et al., 2020; Bandura, 1986; Eun, 2019; McAnally, 2019), and it is also a large part of the expectancy-value theory (Atkinson, 1964; Griffin et al., 2020; Schunk, 2020). An overwhelming 83% of participants indicated through their comments that they had low self-efficacy going into college algebra; all of those students also said they struggled to get through

the course. Furthermore, the expectancy-value theory involves students' motivation to learn new things being positively or negatively affected by what they believe they will receive in return for their success or failure (Atkinson, 1964; Schunk, 2020). When I spoke with them, 11 of the 12 participants said that there was nothing in their college algebra course that they felt was valuable for them in their future careers, and this made them less motivated to care about the course. Finally, the social cognitive theory puts a lot of focus on modeling (Abdullah et al., 2020; Bandura, 1986; Belland et al., 2020; Schunk, 2020). Every single student participant, 100% of them, said they would have preferred to have another option for their mathematics course; a different option could have provided more opportunity for modeling.

It is empirically significant because it reinforces other studies that have been done about all students being required to take college algebra. The literature shows that there is low achievement in college algebra (Burdman, 2013; Childers et al., 2021; Ganga & Mazzariello, 2018; Harrell & Lazari, 2020; Lei & Lei, 2019; Pearce et al., 2017; Skuratowicz et al., 2020). Nine of the 12 participants I spoke with said that they struggled to get through the course, and eight of them only earned a grade of C in the course. The literature also indicates there is nothing in college algebra to help most students in their careers (Blumenthal, 2016; Burdman, 2013; Ganga & Mazzariello, 2018; Stewart, 2018; Strauss, 2019), and only one of the participants in my study found a single concept that she felt would benefit her in her future job. This study also adds to the body of literature because there are no studies that specifically address the experiences that students majoring in English had in their college algebra course. Furthermore, this study did not stop with learning about their experiences; this study took it a step farther to discover what mathematics concepts the students would have liked to have in their course and which mathematics concepts they feel that they will need in their future jobs. I learned that not

only did the students have poor experiences in college algebra, but they did want to take a mathematics class. They would have liked the option of taking a course that taught them more practical concepts such as basic mathematics skills, personal finance, and basic statistics.

While other studies have been conducted among larger groups, this study narrowed the research down to one particular group. The study could be replicated to see if the same results were achieved for students in other majors. The study could also be replicated to see if the same results were achieved among students majoring in English at other colleges.

**Limitations and Delimitations**

Limitations in this study include difficulties in gaining enough participants to get the full essence of the students' experiences, the geographical location, one participant who did not join in any of the focus groups, and the students who volunteered to participate. After two emails, I only had nine participants. For a phenomenology, Creswell and Poth (2018) recommend 10 to 15 participants. Therefore, I used snowball sampling to find the last three participants. Additionally, this study was done at a single college in the Southeastern United States. Students in other areas, or even at a different southeastern college, could have had different experiences. Also, one of the participants would not respond to emails for the scheduling of the focus groups. However, this participant did complete the individual interview and the journal prompts. Finally, all the students in the study had strong opinions about their desire for a mathematics course other than college algebra. It is possible that there are many students majoring in English who did not volunteer to participate because they had good experiences in the course.

Delimitations of the study include only allowing students who were over the age of 18, only allowing students who were in at least their sophomore year of college, and the small sample size. I limited the age to over 18 so that students would be able to consent to the study on

their own. The requirement of being at least a sophomore was made from a concern that freshman participants may be more likely to change their major. I wanted to use students who were fairly certain they were going to continue their college journey as an English major. The small sample size was chosen because I was doing a phenomenological study, and Creswell and Poth (2018) recommended 10 to 15 participants for this type of study.

**Recommendations for Future Research**

Further research needs to be done to determine if students majoring in English would be more engaged and, therefore, more motivated, have higher interest and self-efficacy, and have less anxiety if they could take a mathematics course that would be more closely related to their major rather than a "one-size-fits-all" college algebra course. The findings in this study were very one-sided. Future research could include a survey of all students majoring in English to see if there are others who had positive experiences in their college algebra course. Studies could also be done to determine if more students admit to cheating in college algebra than in other courses, as that was a point that came up in a focus group. Additionally, the study could be replicated at other schools or with other majors. It would also be beneficial to study college algebra professors and look at the methods they use in their courses; it is possible that the teaching styles of the professors could positively or negatively affect the experiences of the students. Finally, it would be beneficial to study people who graduated with a degree in English and who have been working in their jobs for at least five years. The participants in this study do not believe that they will need any of the concepts taught in college algebra in their careers; a study of those who had been working in those careers five years or more could help to confirm or disprove that assumption.

## Conclusion

In conclusion, the purpose of this hermeneutical phenomenological study was to explore the experiences of college algebra among English majors at Thomas University. Bandura's (1986) social cognitive theory and Atkinson's (1964) expectancy-value theory guided the study. The study aimed to answer the central research question "What are the experiences of college students majoring in English in their required college algebra course?" A review of the literature indicated that students would not have a favorable experience, but I began the study with an open mind, and I was willing to prove that assumption wrong. I used a hermeneutical approach because I sought to discover the essence of the lived experiences of a group of people and because I was aware of biases. I used individual interviews, journal prompts, and focus groups to discover the essence of the lived experiences of the 12 participants. Data analysis was done using van Manen's (1997) thematic analysis method.

The themes that emerged included poor experiences in college algebra, where students felt that they were "just checking boxes," which led to frustration and a feeling that they were wasting their time and their money. The participants also had a desire for a different option than college algebra as a mathematics requirement; they wanted something that included practical mathematics such as personal finance and statistics rather than formulas and graphs. These English majors also felt that there was nothing for them in their college algebra course since it lacked concepts that students majoring in English would be able to use in their careers. The main takeaway from this study is that students majoring in English at Thomas University would like to have an option for a mathematic course that includes more practical concepts and that ties mathematics and English together. I believe a math pathways option would be appropriate for the college. Further research should be done, however, to either reinforce or refute this study.

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# Appendix A

## Individual Interview Questions

1. Please describe your social and educational background through your high school graduation. CRQ
2. What were your experiences in your college algebra course? CRQ
3. Describe what you learned in your college algebra course that you feel was beneficial. SQ1
4. What did you learn in your college algebra course that has helped you as an English major? SQ1
5. What else would you like to add to our discussion of your experiences in college algebra that we haven't discussed? SQ1
6. Describe options to college algebra that would transfer as a general education requirement, if any, you would like to see available for English majors as a mathematics course. SQ2
7. If you could create a mathematics course specifically for English majors, what would it look like. SQ2
8. What else would you like to add to our discussion about options for an undergraduate mathematics course for English majors? SQ2
9. What mathematics abilities do you think you will need in order to do your future job well? SQ3
10. Describe the challenges you have when trying to do mathematics that you think you will need in your future job. SQ3

11. What else would you like to add to our discussion about the mathematics abilities you think you will need to be able to do your job well? SQ3

## Appendix B

## Journal Prompts

Complete the following prompts with at least two paragraphs.

1. “My best experience in my college algebra course was ...” CRQ
2. “My biggest challenge in my college algebra course was ...” CRQ
3. “If I were to design a required college mathematics course for English majors, it would include _____, and it would not include _____.” SQ2 and SQ3

## Appendix C

## Focus Group Questions

1. Can you describe any specific times in your college algebra courses when you were excited to be learning a concept? SQ1
2. Can you describe any specific times in your college algebra courses when you were frustrated about learning a concept? SQ1
3. Can you explain your opinions on the idea of having some other mathematics course that could be tailored to be more applicable for English majors? SQ2
4. What mathematical concepts from your college algebra courses do you feel confident you will use in your jobs? SQ3
5. What mathematical concepts do you feel that you will need in your future jobs that were not taught in college algebra? SQ3
6. Can you tell me about any struggles that any other English majors you know have had in their college algebra courses? CRQ

## Appendix D

## Consent Form

**Title of the Project:** A Hermeneutical Phenomenological Study Exploring the Experiences of College Algebra Among English Majors

**Principal Investigator:** Kelli M. Thomas, Liberty University Online

### Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be a student at Thomas University majoring in English. You must be in your second year of your program, and you must have taken college algebra. You must be 18 years of age or older to participate. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

### What is the study about and why is it being done?

The purpose of the study is to explore the experiences of college algebra among English majors. The researcher is seeking to learn the benefits of college algebra for students majoring in English, the mathematical content English majors would like to see included in college algebra, and the mathematics abilities English majors feel they will need to know to be successful in their expected future jobs.

### What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

1. Take place in at least one one-on-one interview that will take approximately one hour. These questions will be relating to college algebra and your feelings about this course. This interview will be audio recorded.
2. Complete three journal prompts. These prompts will be given to you at the interview and will be completed at your leisure. You will have at least two weeks to complete the prompts.
3. Take place in at least one focus group which will take approximately one hour. The focus groups will cover the same topics and will also be audio recorded.

### How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include the possibility of using this study to change the way mathematics courses are required at the college and university level.

**What risks might you experience from being in this study?**

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Please understand that I am a mandatory reporter, which means that I am required to report any information I become privy to involving child abuse, child neglect, elder abuse, or intent to harm self or others.

**How will personal information be protected?**

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records. Data collected from you may be shared for use in future research studies or with other researchers. If data collected from you is shared, any information that could identify you, if applicable, will be removed before the data is shared.

- Participant responses will be confidential. Participant responses will be kept confidential through the use of pseudonyms and codes. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted.
- Interviews and focus groups will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researcher will have access to these recordings.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with persons outside of the group.
- Journal prompts will be stored in a locked file cabinet. All prompts will be destroyed after three years.

**Does the researcher have any conflicts of interest?**

The researcher serves as a teacher at Thomas University. To limit potential or perceived conflicts, any student who has been in the researcher's class or who might take a class taught by the researcher will be excluded from participating. No action will be taken against an individual based on his or her decision to participate or not participate in this study.

**Is study participation voluntary?**

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Thomas University or Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

**What should you do if you decide to withdraw from the study?**

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, apart from the focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

**Whom do you contact if you have questions or concerns about the study?**

The researcher conducting this study is Kelli M. Thomas. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at kmthomas20@liberty.edu. You may also contact the researcher's faculty sponsor, Dr. Laura Jones, at lejones2@liberty.edu.

**Whom do you contact if you have questions about your rights as a research participant?**

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

*Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.*

**Your Consent**

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

*I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.*

☐ The researcher has my permission to audio record me as part of my participation in this study.

_____

Printed Subject Name

_____

Signature & Date

## Appendix E

## IRB Approval Letter

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

June 13, 2022

Kelli Thomas
Laura Jones

Re: IRB Exemption - IRB-FY21-22-1001 A Hermeneutical Phenomenological Study Exploring the Experiences of College Algebra Among English Majors

Dear Kelli Thomas, Laura Jones,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

**Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB.** Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,
**G. Michele Baker, MA, CIP**
***Administrative Chair of Institutional Research***
**Research Ethics Office**

## Appendix F

## Sample of Transcript from Laura's Interview

Laura (cont): I took that course just to check it off the box. So, like, for me, I just became frustrated a lot because I'm like, "Why do I need to learn this? This is not going to help me anyway.

Kelli: Okay. Now … Describe what you learned in your college algebra course that you feel was beneficial.

*20 second pause

Laura: I'm sorry. I'm really trying to remember.

Kelli: I know. I've had some just say, "nothing," so I appreciate you thinking about it and trying to remember and think of something that was beneficial.

Laura: Like, it was just mostly like formulas and stuff that you could plug numbers into. Even with percentages and stuff, you know? Nothing helpful like actually figuring things out like, maybe, percent off at a store or something like that. You know, there wasn't anything simple or like simple concepts. It was all more of the advanced stuff that I don't think, I mean, I know I'm not going to use it. I just can't think of anything.

Kelli: Ok. What did you learn in your college algebra course that has helped you as an English major?

Laura: As an English major? Oh. Wow. Like, there's nothing. I mean, the only math I can think of that I use as an English major would be, um, like measuring lines and things like that in poetry, and like, the rhythm and things like that. And I've always struggled even with that! It ties back to numbers, and there was nothing like that in algebra. It was all just formulas and graphing and stuff.

## Appendix G

### Autumn's Journal Prompts

Complete the following prompts with at least two paragraphs.

1. "My best experience in my college algebra course was …"

My best experience in my college algebra course was in the layout of the assignments in the course. The instructor for this class laid out the assignments in the form of worksheets, study guides, and tests. Having an array of practice exercises before the test helped me feel better prepared. I also enjoyed how the test questions reflected the study guide questions as well.

Adding to this experience was the attitude of my instructor. She was very positive, but also straightforward and made expectations clear. She never forced everyone to love math but still expected everyone to put forth their best effort She was authentic in her teaching and interaction with students and made everyone feel comfortable communicating with her about assignments or the course in general. She made this math class more enjoyable just by having the attitude she did.

2. "My biggest challenge in my college algebra course was …"

My biggest challenge in my college algebra course was grasping the material in the allotted timeframe before tests. Some of the content covered in class was more challenging for me to understand and it would at times be overwhelming trying to prepare myself adequately for tests. There were a few times I turned in tests that I knew would not reflect my best work, but I had done all I could to answer at least a few questions correctly.

It was hard not to get discouraged when things like this happened. Luckily, I had some trusted friends and family members who helped me through it. The instructor was also willing to help answer my questions and provide clarity without belittling me, which I appreciated. I took

great pride in the small achievements made during this course regardless of my shortcomings with some of the content.

3. “If I were to design a require college mathematics course for English majors, it would include _____, and it would not include _____.”

If I were to design a required college mathematics course for English majors, it would include a way to find middle ground between Math and English, and it would not include just mathematical concepts separate from potential use in English. The course would aid English majors in utilizing mathematics concepts in English work and help them draw connections between the fields in a way that helps aid their understanding of both fields. Specific uses and examples of how this could be achieved would be a primary focus in the course.

Additionally, tying in the Liberal Arts nature of the English field would be a focus of the course. Assignments would vary in format and content, but would all be centered around shaping math in a way that English majors can better understand. The course would also have assessments that mirrored those typically given in English classes or in formats that were more suitable to an English major’s potential future job. Ultimately, I would try to design a mathematics course that would not intimidate English majors just by reading its title.

## Appendix H

## Nita's Journal Prompts

Complete the following prompts with at least two paragraphs.

1. "My best experience in my college algebra course was …"

My best experience in my college algebra course was probably due to the effectiveness and kindness of my professor. I met with her several times throughout my first semester at college, confused and overwhelmed with the course content, and she helped me by creating and posting "study sheets," so that I could practice what we were learning in class throughout the week before our exams.

This really helped me grow in confidence and find my footing where basic college math was concerned. It helped me feel better the following semester when I had to take EN 100 and then 112 – both algebra-based courses. The second was required even after I changed my major from Business to English.

2. "My biggest challenge in my college algebra course was ..."

My biggest challenge in my college algebra course was actually getting through the course. The entire time I was taking math classes in college, I was aware that the skills I was learning would be skills that were immediately lost once I was done with the required courses. It was so frustrating. I knew that, for my major, the information I was gaining would not be put to use in my field of study or practice.

3. "If I were to design a required college mathematics course for English majors, it would include _____, and it would not include _____."

A college mathematics course for English majors should take more of a language-based approach – rooted in the arts, in communication with words as opposed to numbers. I know that

there are some of us who are English and Education majors and who need a little more than basic math as they go into their field of choice. However, there are a lot of us (like me) who will not use anything beyond basic math skills for everyday life or their job.

Real-world application is important for those of us who aren't going into STEM fields. Taxes, bills, budgeting – these are all things that we are ill-prepared for throughout college and going into the workforce. I would rather sit through a class that teaches these basic mathematical skills that prepare me for the rest of my life than feel as though I were wasting money and time preparing for a field or fields that I will never enter.