Assessing Math Motivation, Educational Expectancy, and Grades in Corequisite Coursework to Predict Outcomes in College Algebra

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Assessing Math Motivation, Educational Expectancy, and Grades in Corequisite Coursework to Predict Outcomes in College Algebra

A Dissertation

Submitted to the Graduate Faculty of the University of New Orleans
In partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In Educational Administration

By
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B.A. University of New Orleans, 2002
M.Ed. University of New Orleans, 2004

August, 2023
Dedication

To my parents, Wayne and Audrey Ovella. Thank you for always believing in me and never letting me give up. To my loving wife, Wendy Ovella. Thank you for always pushing me to achieve my goals. To my children, Kate and Lucas. Thank you for giving me the inspiration to become a better person. This one is for you all.
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Abstract

The lack of preparation and math motivation are obstacles for new students entering higher education. Students who are underprepared in math often lack the skills and motivation to succeed in College Algebra. The purpose of this research study is to assess student math self-efficacy, task value, intrinsic value, educational expectancy, and grades in corequisite coursework to predict outcomes in College Algebra. Using binary logistic regression, the researcher examined motivational factors and corequisite course grades to determine their impact on student success in College Algebra. The primary objective of the present study was to examine college students’ math achievement in College Algebra within the framework of the Expectancy-Value Model of achievement motivation theory to determine the correlation between students’ motivational beliefs and their final math outcomes. Data was collected for students enrolled in College Algebra at The University of New Orleans and Southeastern Louisiana Universality.

Results showed math self-efficacy, educational expectation, and corequisite grades to be significant predictors of final outcomes in College Algebra. Task value, intrinsic value, gender, and race were insignificant factors in predicting final algebra outcomes. With regards to student achievement, this study’s findings reveal that students perceived self-beliefs about their ability to do well in math related activities and their general beliefs about eventual college graduation and beyond significantly impact the likelihood of passing College Algebra.
CHAPTER 1: Introduction

Math achievement is strongly associated with students’ chances of being accepted to their college of choice, choosing a major, and persisting to graduation (Buddin & Croft, 2014; Finn, Gerber, & Wang, 2002; Tafoya, 2013). Furthermore, math serves as a foundation for high paying jobs in STEM fields and is associated with job development and success in social science fields (Gandhi-Lee, Skaza, Marti, Schrader, & Orgill 2017). Even with the preponderance of evidence that math achievement is linked to successful college graduation and high paying jobs, American high school students’ achievement in math is below the average of the 35 Organization for Economic Co-operation and Development (OECD) member countries; of the 35 countries, the United States ranks 25th (along with Ireland and Portugal) only ahead of Italy, Spain, Latvia, Greece, Israel, Turkey, Chile, and Mexico (OECD, 2010). Studies have shown motivation to learn math decreases as students’ progress from elementary school to high school (Spinath & Steinmayr, 2008). This lack of math knowledge and motivation can lead to a negative outlook towards math-related learning and thus effects student performance in College Algebra inhibiting potential college success and graduation (Doménech-Betoret, Abellán-Roselló, & Gómez-Artiga, 2017; Guo, Parker, Marsh, & Morin, 2015).

Theorists of achievement motivation strive to understand and explain people’s choices of tasks they decide to pursue, their persistence on those tasks, and how motivational factors influence task outcomes (Eccles, Wigfield, & Schiefele, 1998). Atkinson (1957), defined the principle of motivation as an individual’s willingness or motive to perform a certain act, their expectancy that the act will be completed, and that the act will result in some incentive upon completion: Motivation = f (Motive x Expectancy x Incentive). An individual’s persistence and behavior is guided by the strength of motivation to perform and the motivation to complete an
Understanding what motivates students to understand math and have success in math coursework was the central focus of this study.

**Problem Statement**

Lack of preparation and math motivation serve as major obstacles for students entering higher education; students who lack the skills and motivation to succeed in College Algebra will have difficulty with persistence and degree attainment starting with their first semester in college (Collins, 2013). Roughly, only one quarter to one-third of high school students who enter college meet the minimum standards to succeed in math at the college-level and that number is even smaller for underrepresented populations (Long & Boatman, 2010). Among all post-secondary students entering two and four-year colleges and universities between 2010 and 2014, an estimated 43% of African American students and 42% of Hispanic students enrolled in a developmental course; in comparison, 30% of White students and 34% of Asian students required remediation; female students require remediation at slightly higher rated than male students at 37% and 34% respectively (U.S. Department of Education, 2014). In recent years, it has been estimated that 20% of students entering four-year institutions and 52% of students entering two-year institutions require remedial coursework. (English, Cushing, Therriault, & Rasmussen, 2017). The problem only begins there. Of the students requiring remediation in math, only 22% complete the remedial course, or sequence of courses, and the associated college-level course within two years; failure to complete remedial coursework halts student progress in college and leads to a dramatic increase in the likelihood of student attrition and dropout. (Complete College America, 2012).

Remedial education was first developed as a tool to expand access to underprepared college students who lack academic preparation and knowledge to succeed in college-level
coursework (Tierney & Garcia, 2011). But in reality, remedial coursework has been shown to be a barrier to student success and eventual completion of a college degree (Ngo & Kosiewicz, 2017). Without some level of understanding of why students are unsuccessful in remedial math coursework, the persistence and graduation rates in higher education will continue to suffer (Okimoto & Heck, 2015; Pruett & Absher, 2015). We know students are placing into and failing developmental coursework at high rates. The questions remain, what factors are contributing to college students’ poor performance in remedial coursework? And what factors influence success in remedial coursework? Understanding why students fail early math courses will allow campuses to use resources to design interventions that will successfully accommodate students in need of assistance in math-related activities.

Although there is a great deal of research (Barbatis, 2010; Okimoto et al., 2015; Pruett et al., 2015) on the issues first semester freshmen attending community colleges face regarding math preparation and motivation, some states (e.g., Colorado, Florida, Illinois, Louisiana, Montana, North Dakota, New York, Missouri, Minnesota, Tennessee, and Texas) have shifted remedial education responsibilities strictly to community colleges (Chen 2016; Wilson, 2012). In these cases, students who require math remediation are forced to forego their enrollment in a four-year institution and instead enroll in a community college to obtain the math skills required to succeed in College Algebra (Kirst & Bracco, 2004; Jacobs, 2012). These policy shifts in are in response to the nearly two-billion-dollar annual cost of college remediation and the low number of students who actually make through traditional remedial sequence (Chen 2016; Complete College America, 2012).

In the case of Louisiana, a 2010 Board of Regents policy barred students needing remediation from enrolling in state universities; the policy states, students scoring below a 19 on
the mathematics portion of the ACT test require remediation before entering college and must attend a community college (AACRAO, 2015, July 16). Nationwide, community colleges enroll over 45 percent of all first-year post-secondary students and often have the greatest problems with preparedness, retention, and degree completion (Kirst & Bracco, 2004).

The traditional model for remediation in math, which consisted of one to four semesters of non-credit courses, too often resulted in students “leaking out of the system and never making it to a college gateway course” (Vandal, 2014, p. 1). Depending on the amount of remediation needed, students were placed into the appropriate level of the remediation sequence. The length of the sequence varied depending on the institutions remediation policies (Frye, 2014). Studies have shown that students placed into the remedial sequence often fail to complete the sequence and never enroll in College Algebra; moreover, the lower a student places in the sequence drastically reduces their chances for success (Bailey, Jeong, & Cho 2010; Jaggars & Hodara, 2011). These concerns are applicable to all two and four-year institutions, but greatly impact two-year institutions who now have the sole responsibility, in many states, for remediating students deficient in math.

One reason to be concerned about the policy push towards forcing all remedial work to community colleges is the low persistence rates for these institutions. According to a report by the National Student Clearinghouse (2016), students who begin their education at a four-year institution have a higher probability of first year persistence than students who begin their education at a community college. First year students enrolled in a four-year institution are 22.3% more likely to persist in their first year of study than peers attending community college (National Student Clearinghouse, 2016); students attending four-year colleges have a first-year persistence rate 10.2% higher than the national average. Remedial education has been proven to
be a barrier to degree completion and this barrier is even greater if students are forced to complete developmental sequences at two-year public institutions (Complete College America, 2012).

In response to the changes in developmental education policy, some four-year institutions have developed programming to meet the needs of students who do not meet the minimum requirements in math to be admitted directly into the four-year institution (Vandal, 2014). The corequisite model is one such approach that allows students who do not meet the minimum requirements for admission to be allowed into the institution provisionally and enter directly into College Algebra while simultaneously taking a supplemental course that is aligned with the standards of the college-level course (Complete College America, 2012). Unlike the traditional remedial sequence, the corequisite model allows students to earn college credit for the supplemental coursework; this allows four-year universities to bypass the remedial mandate and admit students lacking the necessary skills and placement test scores in mathematics.

Students in the corequisite model complete gateway courses at higher rates; completion of gateway courses has been established to be a valid predictor of college completion (Collins, 2013; Boylan, Calderwood, & Bonham, 2017). The corequisite model has consistently produced data showing students participating in the program complete gateway math courses at higher rates than students participating in the old remedial model (Atkins, 2016; Boylan, Calderwood, & Bonham, 2017; Collins, 2013; Complete College America, 2016; Vandal 2014; Rutschow, Diamond, & Serna-Wallender, 2015). Baseline data collected from the Texas Community College System indicated only 26% of students placed into remedial math passed the course with a C or better and only 20% on those students went on to enroll in a College Algebra course within the next three years; while students enrolled in the new corequisite model passed
developmental coursework at a rate of 65% and 30% of those students went on to pass a college statistics course within two semesters (Rutschow et al., 2015). Using the corequisite model, West Virginia community colleges improved their pass rates in gateway mathematics courses by 48%, from 14% to 62%; Similarly, Tennessee community colleges, improved their pass rates by 51%, from 12.3% to 63.3% (Complete College America, 2016). Campbell (2015) suggests that the corequisite model provides an environment that fosters the growth of student math self-efficacy and math motivation. The results of this study add to the knowledge base of understanding why the corequisite model has shown success and what factors contribute to the increase in math self-efficacy, motivation, and achievement that have been attributed to corequisite coursework. When considering motivation, factors such as self-efficacy, utility value, intrinsic value, educational expectation, gender, and race were used in the study because these factors have been shown to be significant predictors of achievement motivation (Eccles, et al., 1983)

**Purpose of the Study and Research Questions**

The purpose of this study was to assess students’ value of math and educational expectancy to determine if these variables are accurate predictors of overall math achievement in an introductory College Algebra course. Students’ math self-efficacy, utility value, intrinsic value, educational expectation, gender, and race were assessed and used as independent variables to predict students’ final outcome in College Algebra. Previous studies (Byrnes, 2003; Koller, Baumert, & Schnabel, 2001) have found gender, race and motivational factors are significant predictors of students’ math outcomes. The present study also focused on the success rates of the students enrolled in the corequisite pathway and determined that grades in corequisite math coursework are accurate predictors of final outcomes in College Algebra. In a similar study conducted on the corequisite pathway, Charlene Atkins (2016) found student attendance in a
corequisite lab was strongly correlated with academic performance in a college math gateway course. The present study will attempt to further the findings of Atkins to include grades and motivational factors as independent variables to predict the dependent variable, pass/fail College Algebra.

Many studies (Atkins, 2016; Anders et al., 2007; Crombie et al., 2005) have shown math value and expectancy have a direct impact students’ overall achievement. The Expectancy-Value Model of achievement motivation theory (Eccles, 1983; Eccles & Wigfield, 1995; Wigfield & Eccles, 2000; 2002) is a widely accepted theory that has successfully been used to determine students’ motivation in relation to their academic achievement. The primary objective of the present study was to examine college students’ math achievement in College Algebra within the framework of the Expectancy-Value Model of Achievement Motivation Theory and show a correlation between students’ motivational beliefs and their final math outcomes. Although previous studies have shown a positive correlation between math motivation and math achievement, few have looked into factors that drive motivation to learn math. Research suggests that students’ self-perception, confidence, and attitudes towards math are strongly linked to persistence and motivation to study and be successful in math-related activities (Benken, Ramirez, Li, & Wetendorf, 2015). Students with positive math identities (Bishop, 2012) will have a greater likelihood of thinking mathematically, understand math content, and dedicate extra effort to math activities (Kargar, Tarmizi & Bayat, 2010). Bishop (2012) defines identity “as s a dynamic view of self, negotiated in a specific social context and informed by past history, events, personal narratives, experiences, routines, and ways of participating” (p. 38). In the present study, identity consisted of students’ math self-efficacy, utility value, intrinsic value, educational expectation, gender, and race. Binary logistic regression was used to determine the
influence of the independent variables (grade in corequisite course, math self-efficacy, utility value, intrinsic value, educational expectation, gender, and race) on the dependent variable (outcome of College Algebra) for students enrolled in College Algebra. The research questions for this study are:

**Research Questions**

1. **Research Question One (RQ1):** Do students’ perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations predict success in College Algebra?
   
   *Null hypothesis one (H01):* Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have no impact on outcomes in College Algebra.
   
   *Alternate hypothesis one (H01):* Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have a significant impact on outcomes in College Algebra.

2. **Research Question Two (RQ2):** Does successful completion of a corequisite mathematics course accurately predict passing scores for students enrolled in College Algebra?

   *Null hypothesis two (H02):* Success in College Algebra is not impacted significantly by successful completion of a corequisite math course.

   *Alternate hypothesis two (H02):* Success in corequisite coursework has a significant impact on performance in College Algebra.

3. **Research Question Three (RQ3):** Are race and gender statistically significant factors in relation to outcomes in College Algebra?

   *Null hypothesis one (H03):* Race and gender have no impact on success rates for students in College Algebra.
**Alternate hypothesis two (H03):** Race and gender have a significant impact on success rates for students in College Algebra.

**Definition of Terms**

The terms defined in the following section are used throughout the present study and are directly related to the research. The following definitions relate directly to student motivation and College Algebra.

**Ability beliefs.** Individual’s perception of their own competence in math-related activities (Wigfield & Eccles, 2000).

**Achievement/Attainment value.** Individual’s perception of how important it is to succeed on a given math task (Wigfield & Eccles, 1992).

**Corequisite model.** Designed to replace the remedial education model, the corequisite model allows students to enroll in a remedial course while in a College Algebra course reducing the need for a multi-semester sequence of math remediation (Complete College America, 2012).

**Educational expectation.** Individuals’ perceptions of their educational possibilities based on their abilities, past performance, and ambitions (Morgan, 1998).

**Expectancy beliefs.** Beliefs individuals have about their probability of success on a given task (Eccles et al., 1983).

**Gateway course.** A credit-bearing course that serves as a foundation to a program of study that counts for degree credit and completion (Atkins, 2016).

**Intrinsic value.** Individual’s personal enjoyment of math-related activities. (Wigfield & Eccles, 1992).
**Motivation.** An individual’s willingness to perform a certain act, expectation the act will be completed, and belief the act will result in some incentive upon completion (Atkinson, 1957). Motivation in this study will deal directly to math-related activities.

**Remedial math education.** Also known as developmental math education. A class or sequence of classes designed to assist students to achieve expected math competencies to enter college-level coursework.

**Self-efficacy.** Individual’s beliefs in their ability to succeed in specific situations or accomplish a task (Bandura, 1977).

**Utility value.** Individual’s understanding of how current tasks relate to future goals (Wigfield & Eccles, 1992).
CHAPTER 2: Literature Review

The following literature review focuses on research pertaining to remedial education, college student readiness, the corequisite model, and how student achievement motivation interacts with or helps to predict success in College Algebra. The literature chosen to inform this study included various topics and consisted of literature on the history of remedial education in American higher education, college student readiness, remediation policy, the corequisite model for remedial education, student motivation and success, Expectancy-Value Theory of Achievement Motivation, and various studies using Expectancy-Value Theory to inform student persistence in remedial math and College Algebra. The literature chosen helped to frame a theoretical framework that served as a guide the present study. Findings related to Expectancy-Value Theory are presented and synthesized to determine contributions to the field, strengths, weaknesses, and possible gaps that needed to be filled to further understand motivation, persistence, and retention in College Algebra.

History of Remedial Education

Throughout the history of the United States, postsecondary institutions have provided programs and services designed to assist students in meeting the academic rigor required to succeed in introductory-level college coursework (Arendale, 2011; Tucker, 2013). From the early days of higher education, institutions accepted students who were underprepared to meet the minimal standards to succeed in higher education; at the same time, institutions began developing ways to meet the needs of these diverse learners (Casazza, 1999). Beginning in the 1600s, America’s first universities, Harvard (established 1636), Yale (established 1701), and William and Mary (established 1693), began provided these programs and services in the form of tutoring (Arendale, 2011). This early form of developmental education was created in response
to postsecondary institutions implementing admission requirements and the fact that nearly all students seeking admission to these institutions were deficient in Greek and Latin and were unable to be fully admitted. At Harvard and Yale, precollege academic assistance in the form of tutoring mostly consisted of private tutors who helped prepare possible students who were deficient in Greek and Latin prepare for the college entrance exam (Arendale, 2011; Cremin, 1970). Yale was the first college to require math in the curriculum prompting the need for student services in that area (Boylan, 1993).

Starting in the 1820s the U.S. population began its migration westward; as these areas began to develop there was a strong need for postsecondary education (Craig, 1997). Because of the lack of secondary education and often primary education in these newly developed areas, many students desiring to attend postsecondary education were not able to read or write at the level required to be admitted to and attend college (Craig, 1997). Nearly all students were in need of remediation in order to enter these institutions (Arendale, 2011). At the time, postsecondary institutions offered a fixed and prescribed curriculum for all college students and had little place for courses designed to assist students with deficiencies. Harvard University was the first postsecondary institution that allowed students elective coursework in the place of the required curriculum coursework (Thelin, 2011). This shift in policy at Harvard resulted in the first idea of remedial coursework (Arendale, 2011).

As postsecondary institutions began to open their doors to a more diverse population of students, institutions began to move away from the old model of only offering a fixed curriculum and started offering a more flexible curriculum, which consisted of certain approved electives often used for remedial purposes (Arendale, 2011). These electives made it possible for a more diverse population of students, who were often underprepared, the option to be admitted to
postsecondary education. This shift in curriculum moved institutions away from the elitist view of postsecondary education to a practical view. One Massachusetts senator explained: “A college should be open to boys who seek specific learning for a specific purpose. It should give the people the practical instruction that they want, and not a classical-literary course suitable only for an aristocracy” (Morison, 1936, p. 287).

Although the idea of remedial education was developed in the 1820s, most researchers have documented that the first true developmental education program was created at the University of Wisconsin in 1849 (Arendale, 2011). The university offered remedial coursework in reading, writing, and arithmetic to prepare students for the rigors of credit bearing college coursework. This program, designed to assist underprepared students, was established because the old model of using tutors was not sufficient to meet the needs of a growing and diverse student body. The majority of students at the university were in need of remediation; of the 331 students enrolled at the University of Wisconsin at the time, 290 were enrolled in one or more remedial courses (Arendale, 2011, Brubacher & Rudy, 1976). This model has since been adopted by most institutions across the U.S.

The first Morrill Act of 1862 increased the number of postsecondary institutions across the United States and increased access for students who would otherwise not meet college admission requirements; this influential legislation led to affordable, practical higher education offered by state colleges and universities (Lucas, 2006; Thelin, 2011). Increased access to higher education led to a greater need for remedial programming (Arendale, 2011). By 1889, it was estimated that over 80 percent of the 400 postsecondary institutions in the United States had established a program to assist underprepared students (Canfield, 1889). Much like today, these programs were used as a tool by universities to bridge the gap between learned knowledge in
high school and college entrance requirements. By 1894, more than 40 percent of the 238,000 college students entering college for their first year were enrolled in a college preparatory course (Ignash, 1997). This great need for remediation was due to poor secondary school preparation and low admission criteria at newly developed institutions due to little financial support from state and federal government (Arendale, 2011).

From 1900 to 1940 the federal government became more directly involved with postsecondary education and several significant events, including the Second Morrill Act, The GI Bill, funding for Historically Black Colleges and Universities (HBCU), and the growth of community colleges, resulted in a tremendous growth of students entering postsecondary education (Arendale 2011). From 1869 to 1900, the average amount of students enrolled in institutions doubled mirroring the growth of the overall population at the time. Although the numbers of students were increasing, the rate of college attendance was still low with only two percent of 18 to 24-year-olds enrolled in postsecondary institutions.

In the latter half of the nineteenth century, with the Civil rights act of 1964 and the Higher Education Act of 1965, the role of developmental education in postsecondary institutions was expanded. New, diverse students needed additional assistance outside of the old model of remedial coursework and tutoring and programs began to include activities including educational enrichment and cultural experiences (Arendale, 2011; Korey-Smith 2008). In the 1970s, the percentage of institutions offering remediation increased steadily and institutions found that about 30 percent of entering students were deficient in at least one basic skill.

Remediation has played a role in postsecondary education since the inception of America’s first universities in the 1600s. Although the way remediation has been delivered has changed, the goal has stayed consistent. Remediation, then and now, exists to help students
lacking in the knowledge and skills needed to succeed in college-level coursework in making a successful transition to college-level work.

**Remedial Education: Current Perspectives**

Remedial education was developed to assist students in addressing academic deficiencies and prepare students for college-level coursework. Proponents of remedial education assert that by grouping students with similar needs together, instructors can tailor their teaching strategies to the specific needs of the student population (Bettinger & Long, 2009, Shields & O’Dwyer, 2017). Over the past several decades, remedial education has been criticized as being a barrier to degree attainment that causes students to take coursework that should have been learned in high school; this re-teaching of basic skills has been shown to delay enrollment into college-level coursework, reduce retention and graduation rates, and use taxpayer dollars causing more stress on an already underfunded system of higher education (Complete College America, 2012; Bettinger & Long, 2009). The number of students who require remediation in math has risen substantially over the years. Many factors have been studied in relation to this increase and one of the major factors influencing students need for remediation is inadequate preparation in high school.

Remediation coursework increases students time to earn a degree, adds additional tuition costs to already overburdened students, and often results in student frustration and negative attitudes; students often feel they are retaking coursework that should have been finished in high school (Bailey, 2009). It is estimated that each developmental course taken costs students $3000 and adds $1000 in student loan debt (Barry and Dannenberg, 2016). In addition to the cost involved, remedial education students persist to graduation at lower rates than non-remedial students. In a recent longitudinal NCES study, Chen (2016) tracked student’s college experience
over six years and found that 67% of non-remedial students at public four-year universities had graduated within the six-year period. Of the other non-remedial students, 10% were still enrolled without a degree, 4% attained an associate’s degree or certificate, and 19% had no degree and were not enrolled. In comparison, 55% of remedial completers had graduated, 16% were still enrolled without a degree, 7% attained an associate’s degree or certificate, and 22% had no degree and were not enrolled. Remedial students are not only less likely to graduate, there is a greater possibility of dropout than their non-remedial peers.

Developmental education can also have negative impacts on students receiving federal financial aid; the additional coursework required for remediation could result in students reaching financial aid limitations before graduation and negatively impact rates of persistence (Barbatis, 2010). The old model of remedial education, for the reasons stated above, is a flawed model for student retention, persistence, and eventual graduation. Students forced to enter remediation in math may be faced with decreased motivation to persist through the developmental sequence. The following sections detail reasons why high school students are underprepared for College Algebra, policies related to math remediation, and new programming to replace the outdated multi-semester remediation programs at two-year and four-year institutions of higher education.

**College Readiness**

Students who enter post-secondary education with the assumption that high school adequately prepared them for college work feel shock and resentment when told placement test scores require that they must enter remediation in math (Owens, 2015). Strong American Schools (2008) conducted a poll of students placed into remedial education that showed 37% of students had feelings of frustration about the placement, 21% were surprised at their placement,
18% felt feelings of embarrassment, and 12% felt angry and that the placement process was flawed in some way. Students from low-income families have a greater likelihood of taking remedial coursework than students from high-income families. In 2004, 37% of students from low-income families required remediation compared to 31% of students from high-income families. African American (42%), Native American (41%), and Hispanic (41%) students need remediation at higher rates than White (31%) students. Of the first-generation college students, 39% required remediation compared to 29% of students whose parent had a Bachelor’s degree or higher. Remedial education was first developed as a tool to expand access to underprepared college students who lack academic preparation and knowledge to succeed in college-level coursework (Tierney & Garcia, 2011). On the contrary, remedial coursework has been shown to be a barrier to student success and eventual completion of a college degree.

College readiness can be defined as student ability to enroll in and complete college-level coursework without the need of remediation (Conley, 2012; Darche & Stam, 2012; Kane, 2015). A college ready student begins their college career with the content knowledge and skills required to successfully pass college-level coursework, particularly in the areas of mathematics and English composition. College readiness has traditionally been measured in terms of successful course completion, high school GPA, and standardized test scores (Kamin, 2016). Although these are not the only measurements colleges use to gauge college readiness, they still wield a great deal of influence on whether students are accepted into college or require remediation.

Recent conceptualizations of college readiness have strayed away from what it takes to be accepted into college and have focused on students’ ability to be accepted to and thrive in college; researchers continue to use pre-college metrics, such as GPA and ACT, and post-college
metrics, such as dropout rates in remediation, to measure college readiness and the idea of being college ready now spans the students’ entire academic career (Kane, 2015). Policy efforts surrounding the area of college readiness have mainly concentrated on academic achievement by focusing on the creation of a rigorous high school curriculum, advanced placement, standardized tests, and focus on education standards and accountability systems. Traditionally, college readiness has been defined in academic terms and encouraged high schools to raise their standards and course requirements to meet the rigor required by post-secondary institutions; more recent ideas on the definition of being college ready focus not only on content knowledge, but also a student’s knowledge about college, cognitive strategies of thinking, and non-cognitive strategies including behavior regulation, time management, goal setting, behavior regulation, and positive outlook (Nagoaka & Holsapple, 2017).

Mathematics College Readiness

Over the past several decades, the number of courses required to graduate high school has risen substantially; despite these increases, many students entering college are still unprepared for college-level coursework, with the greatest deficiencies in mathematics (Long, Latarola, & Conger, 2009). Based on self-reported data from 2011-2012, one-third of undergraduates participated in a remedial course, 29 percent at public four-year institutions and 41 percent at public two-year institutions (Skomsvold, 2014). These math deficiencies and the need for remediation are more prevalent in low income, first generation, African American, Hispanic, and female students. These student populations are over represented in college remedial coursework (Fong, Melguizo, & Prather, 2015).

Courses taken in high school are linked directly to college readiness. Students who attempt and pass Algebra II in high school have the greatest likelihood of being prepared for
College Algebra (Long, 2008). Even with this knowledge, many states still do not require Algebra II for high school graduation. Students suffer the consequences when high school math curriculum standards do not align with college readiness standards. This lack of alignment causes students to enter college underprepared for College Algebra and forces them to spend time and money on remedial coursework that often do not count for degree completion and possibly effect financial aid status (Fong et al., 2015). Placement in remedial coursework decreases the probability of earning a degree and is associated with decreased levels of persistence from the first to second year of college (Boatman, 2021).

Students’ self-perception, confidence, and attitudes towards math are strongly linked to persistence and motivation to study and be successful in math-related activities (Benken, Ramirez, Li, & Wetendorf, 2015). Students with positive math identities (Bishop, 2012) have a greater likelihood of thinking mathematically, understand math content, and dedicate extra effort to math activities (Kargar, Tarmizi, & Bayat, 2010). Enrollment in a community college to complete a remedial sequence has been shown to be a barrier to degree completion and has negative implications on student motivation and ability to complete math coursework and eventually graduate with a degree from a four-year institution (Complete College America, 2012).

Lack of preparation in math decreases student motivation to succeed and negatively impacts student’s persistence and goals of degree attainment (Collins, 2013). This lack of preparation and motivation to learn math is apparent in the high number of students that require remediation in math and the alarming number of students who leak out of the educational pipeline within their first year of college enrollment (Kirst & Bracco, 2004; Vandal, 2014). In data obtained from a National Educational Longitudinal Study (NLES), Baily (2009) found that
of the 250,000 first time students sampled nearly 59% enrolled in at least one developmental course in college. The data also showed that only 30% of the students passed all of the developmental math courses required before taking a College Algebra course. Baily also found that degree completion for remedial students is rare. Less than 25% of community college students in the sample who enrolled in a developmental course graduated within eight years of their first enrollment in college. In comparison, nearly 40% of students who did not require any remedial coursework graduated within eight years.

**Remediation Policy**

To add to the remediation issue, four-year colleges and universities in many states have been stripped of the opportunity to offer remedial education to new students entering higher education; students in need of remediation in math, instead of starting their college education at a four-year institution, are now forced to attend two-year community colleges to complete a remedial sequence of courses (Kirst & Bracco, 2004; Jacobs, 2012). Community colleges enroll a large percentage of first-time college students and have been shown to have greater difficulty with retention and degree completion than their four-year counterparts (Kirst & Bracco, 2004). Students who begin their college education at four-year institutions have been shown to persist at greater rates than students who first attend a community college (National Student Clearinghouse, 2016). In 2014, the overall persistence rate for students who started college at four-year public institutions was 82.3%. Of all students who started in public four-year institutions in fall 2014, 70.2% returned to the same institution in the fall 2015. In comparison, the overall persistence rate for students who started college at two-year public institutions was 60%. Of all students who started in public two-year institutions in fall 2014, 48.5% returned to the same institution in the fall 2015 (National Student Clearinghouse, 2016).
The Louisiana Board of Regents and the Department of Education (2011) conducted a study of remedial education in the state to assess the policies, practices, and delivery of remedial education. In the study they found that in 2006, 30% of the 28,009 students entering college for the first time enrolled in at least one remedial course and only 24 percent of that group completed a college-level course in the same subject within two years. In four-year universities, 20 percent of students required a remedial course and 34 percent of that group completed a college-level course within two years. Finally, in two-year colleges 63 percent required remedial and only 14 percent of that group completed a college-level course within two years. Although the 2006 numbers show a greater amount of student success in remedial coursework at four-year institutions Louisiana policymakers decided to remove developmental education from four-year campuses.

Louisiana remediation policy states that starting in the year 2014, students requiring remedial education shall not be admitted to any four-year public university in the state (Louisiana Board of Regents, 2011). Beginning in 2014 The Louisiana Community and Technical College System became the state’s primary provider of developmental education for all post-secondary students. This shift has led to a decline in four-year enrollment and prompted four-year institutions to develop new strategies and models to allow students who do not meet minimum standards in English and mathematics to be allowed to enroll directly into four-year institutions. The corequisite model for developmental education is discussed further in the next section of the paper.

**The Corequisite Model**

To combat the loss of remedial education, four-year colleges have developed and implemented corequisite models of education for students who do not meet the minimum math
requirements to be admitted to the institution (Vandal, 2014). The old model for remediating students in math, consisting of multiple levels of coursework before entering College Algebra, has been proven to hinder and even halt student progression in college (Vandal, 2014). A new model allows students, who do not meet full admission requirements, to be admitted to a four-year institution to bypass semesters of remedial coursework and enroll directly into a math gateway course while taking a supplemental course to replace the developmental sequence (Complete College America, 2012). Students in the corequisite model receive a traditional lecture in the college gateway course and participate in cooperative learning in the supplemental course or lab. This variety of instructional strategies supports cognitive development and math motivation (Osterholt & Barratt, 2010). Students enrolled in a corequisite math program have been shown to have greater success than students who take a sequence of remedial coursework (Collins, 2013; Complete College America, 2016). Nationally only 22% of students enrolled in a remedial math course complete the associated introductory gateway course; states that offer the corequisite option have seen vast increases in completion percentages for students enrolled in the corequisite pathway; of the states studied, Georgia’s pass rate was 63%, Indiana was 64%, Tennessee was 61%, and West Virginia was 62% (Complete College America, 2016; Vandal, 2016). Vandal (2016) studied the corequisite programs at three institutions, College of Coastal Georgia (CCG), Oklahoma State University (OSU), and University of Nevada Reno (UNR). At CCG, before the implementation of corequisite coursework, only 36% of students placed into remedial coursework were completing the associated gateway course within two-years. After implementation, 56% of students enrolled in the pathway are completing College Algebra in a single semester. This in comparison to the 62% pass rate of students placed directly into College Algebra. At OSU, students placed in the corequisite pathway passed College Algebra
with a grade of C or better at a rate of 65.5%. This was only slightly below the 68.8% completion rate for students placed directly into College Algebra. Corequisite students went on to pass subsequent math courses at a rate of 83.7%. Students enrolled in the corequisite pathway at UNR are completing College Algebra at rates higher than students placed directly into College Algebra. Corequisite students passed College Algebra at a rate of 84% compared to 83% of students placed directly into College Algebra.

The corequisite model has been implemented to improve student completion in remedial coursework, and more importantly to allow students to complete credit-bearing coursework in math in their first semester in college, which reduces time to graduation and lowers tuition costs (Complete College America, 2012). The corequisite pathway eliminates the multi semester remedial sequence that has been shown to be detrimental to college student retention and persistence (Vandal, 2014). Early studies of the corequisite model, conducted by the Charles A. Data Center, indicate students enrolled in the program have the potential for higher grades and increased persistence and completion rates in mathematics gateway coursework (Cullinane, 2015).

Institutions in various states have implemented the model despite claims that research on the corequisite model is lacking and that there is no proof the model is sufficient to improve learning for different types of learners (Smith, 2015). Accelerated or corequisite models do not work well for students who lack commitment and undervalue learning in mathematics (Booth et al., 2014). On the contrary, positive significant relationships have documented been between supplemental coursework and performance in the associated College Algebra gateway course (Atkins, 2016). Atkins found a negative significant relationship between math anxiety and
performance in the gateway course. Math anxiety could directly impact student’s attitudes and motivation to succeed in mathematics coursework.

**Motivation and Student Success**

In Motivational Theory, the three components of motivational behavior are 1) choice, 2) level of involvement, and 3) persistence (Pintrich, 2000). In the context of the college classroom, students must make the choice to study or complete required assignments over other activities that they may find more desirable. They must make a commitment to be involved in the learning process and understand commitment to tasks results in success. Finally, they must persist by not being discouraged by difficult tasks and assignments and remain engaged until the task has been completed. Ames (1992) stated that:

> Motivation is too often equated with quantitative changes in behavior (e.g., higher achievement, more time on task) rather than qualitative changes in the ways students view learning themselves in relation to the task, engage in the process of learning, and then respond to the learning activities and situation. (p. 268)

Understanding motivation in this way helps us to understand how intrinsic motivation can drive student learning and success in college coursework.

**Math Motivation**

Students entering college unprepared for College Algebra often face issues with motivation to learn and lack the skills to persist in early math coursework. Students with negative math attitudes have been shown to be less engaged in coursework, which leads them to drop or fail math courses. (Hodges & Kim, 2013). Studies have shown negative math attitudes lead to attrition while positive math attitudes lead to successful completion math coursework (Evans, 2007, Ma & Wilms, 1999). Hodges and Kim (2013) assert that, “it is important to improve the
attitudes of students who are not interested in studying mathematics but need to acquire mathematical literacy” (pp.59). These students are prevalent in developmental coursework and often need additional attention and guidance. Increasing student motivation to learn math results in better math attitudes and higher rates of persistence (Evans, 2007).

**Gender Differences**

Research has shown males demonstrate higher levels of value in math and higher math achievement than do females (Koller, Baumert, & Schnabel, 2001). In a sample of 1,201 female students and 1,064 male students, Trusty (2000) used logistic regression models to examine gender differences toward educational expectation. Although significant positive relations were found for both females and males, self-efficacy was found to be more important for females’ educational expectations. The author found that a one-unit increase in self-efficacy led to a 58% increase in female students and a 40% increase in male students of keeping educational expectations. More recently female students have been shown to be closing the mathematics gender gap; female students are now taking as many, if not more, advanced math courses as their male counterparts (Dalton, Ingels, Downing, & Bozick, 2007). The present study tested the above findings and found that the gender gap is continuing to close for students in gateway math courses.

**Ethnicity Differences**

African-American and Hispanic students have historically underperformed in mathematics in comparison to their Caucasian and Asian peers and studies have sought to explain the differences in achievement and achievement motivation (Byrnes, 2003). In a secondary analysis of the National Assessment of Educational Progress dataset, Byrnes (2003) found that math motivation, self-efficacy, and task value all contributed to math achievement by
Caucasian, African-American, and Hispanic students. The author also found that motivation was a contributing factor in math proficiency scores, where white students had the highest proficiency at 301, followed by African-American students at 268, and finally Hispanic students at 277. African American and Hispanic students had arithmetic competence and some ability for measurement, geometry and simple logical relations, while White students had the same skills plus simple data interpretation, ability to perform operations with rational numbers, and some algebraic abilities. The present study compared math value and achievement and assessed differences found between the ethnic groups involved in the study.

**Theoretical Framework: Expectancy-Value Theory**

Expectancy-Value Theory (Eccles et al., 1983; Eccles, 2009) provides a framework for achievement motivation that helps to explain students’ effort, choices, and achievement in relation to academic and non-academic domains. Expectancy-Value Theory (Eccles, 2009, 2011) suggests achievement-related outcomes are directly influenced by expectancies for success (i.e., academic self-concept) and subjective task value. Expectancies represent belief in one’s own ability, while task value represents one’s understanding of the costs and benefits associated with a particular pathway (Eccles, 2011). Individual characteristics and previous academic achievement shape the development of task expectancy and value beliefs; those expectations and beliefs impact student motivation and in turn influence academic performance (Wang & Degol, 2013).

Theorists of achievement motivation strive to understand and explain people’s choices of tasks they decide to pursue, their persistence on those tasks, and how motivational factors influence task outcomes (Eccles, Wigfield, & Schiefele, 1998). Atkinson (1957), defined the principle of motivation as an individual’s willingness or motive to perform a certain act, their
expectancy that the act will be completed, and that the act will result in some incentive upon completion: Motivation = f (Motive x Expectancy x Incentive). An individual’s persistence of behavior is guided by the strength of motivation to perform and the motivation to complete an act.

Building on Atkinson’s ideas, Eccles et al., (1983) developed an Expectancy-Value Model of achievement motivation and used the model to study how individual’s expectations and values influence choice, persistence, and performance. In the model, assumptions are made that individual’s values and expectancies directly influence achievement choices, performance, effort, and persistence. Expectancies and values are influenced by task specific beliefs including beliefs in ability, perceived difficulty of the task, and individual’s goals (Wigfield & Eccles, 2000). Ability beliefs refer to individuals’ perceptions of possessed abilities on a given task while expectancy refers to an individual’s belief future success.

FIG. 1. Eccles, Wigfield, and colleagues’ expectancy–value model of achievement motivation.
Individuals’ belief in their own abilities play a prominent role in theories of achievement motivation. Weiner (1985) introduced the attribution theory, which stated individual’s ability beliefs remained constant over time and that they had little control over those abilities. He argued individual’s belief in their abilities played a major role in their motivation to succeed. Positive ability beliefs were attributed to positive task outcomes and negative ability beliefs led to negative task outcomes. In his self-worth model, Covington (1992) studied individual’s ability beliefs. He argued individuals, to maintain a positive self-worth, attempt to maintain a positive sense of their abilities. Covington noted a considerable difference in developmental differences of individuals’ conceptions of their own abilities. Expectations and ability beliefs play an important role in the Expectancy-Value Model of Achievement Motivation, but individuals perceived value of a task also has strong implications to future success and motivation on a given task.

Eccles et al., (1983) defined four different components of achievement value: attainment value, intrinsic value, utility value, and cost. Attainment value refers to an individual’s belief in the importance of a task. Eccles (2011) conceptualizes attainment value in terms of the needs, values and individual motives that an activity satisfies. Individuals’ needs and values help to determine individual’s attainment value of a task. Intrinsic value refers to how much an individual enjoys a task. Positive intrinsic motivation has been shown to have strong, positive psychological consequences to task outcomes (Deci & Ryan, 1985). Utility value (usefulness) refers to how a specific task fits into an individual’s future plans. If a student is enrolled in a developmental math course that will not count as college credit for a degree, he or she may perceive little or no utility value, thus negatively affecting the outcome of the course. Finally, cost refers to how the decision to engage in an activity affects the ability to engage in other
activities. Cost also refers to individuals’ assessments of the effort required to complete an activity.

**Expectancy-Value Theory: Related Studies**

Expectancy-Value Theory was developed to predict achievement related behaviors; those behaviors include course selection, performance, and persistence on academic tasks (Wigfield & Eccles, 1992, 2000). Theorists of Expectancy-Value Theory argue individuals’ choice, persistence and performance can be predicted by their belief of how well they will do on the activity and the extent to which they value that activity (Crombie et al., 2005; Wigfield & Eccles, 1992). Various studies (Crombie et al., 2005; Eccles, Adler & Meece, 1984; Meece, Wigfield, & Eccles, 1990; Wigfield & Eccles, 2000) testing Expectancy-Value Theory have attempted to predict academic performance and subsequent course enrollment. The studies use performance expectancy to predict academic performance and task value to predict course enrollment.

**Educational Expectations and Math Achievement**

Educational expectation refers to students’ perceptions of their educational possibilities based on their abilities, past performance, and ambitions (Morgan, 1998). Educational expectation has been proven to be a valid indicator of future academic achievement (Andres, Adamuti-Trache, Yoon Pidgeon & Thomsen, 2007). Anders et al., (2007) conducted a ten-year longitudinal study with 1,055 high school graduates. In the study, educational expectation was measured and used to show that 62% of students attained their educational expectations when they expected to attain a Bachelor’s degree. Of the students who did not expect to earn a Bachelor’s degree, 82% did not earn the degree. The current study showed that students’ educational expectations can also predict their final outcomes in College Algebra.
Academic Self-Efficacy and Math Achievement

While educational expectation refers to students’ educational possibilities, or perceived academic ceiling, academic self-efficacy is an individual’s belief he or she has the capability to successfully complete an academic task (Bandura, 1997). Academic self-efficacy in math can be defined as an individual’s perception or belief of his or her ability to do well in math coursework (Wigfield & Eccles, 2000). When faced with failure, students with high self-efficacy beliefs view tasks as challenges, remain committed to goals, and try harder when facing failure (Wigfield & Eccles, 2002). Individuals with low self-efficacy beliefs often focus on their weaknesses and give up when placed in a difficult situation.

In a study of 438 participants, Stevens, Wang, Olivarez, & Hamman (2007) found 18% of variance in students’ performance on a standardized test was explained by the students’ self-efficacy beliefs. Crombie et al., (2005) found students’ self-efficacy was a valid predictor of final grades in math. In the present study a positive link was established between self-efficacy and math achievement.

Task Value and Math Achievement

Task value refers to students’ perceived importance of a task, or the reason the student decides to engage in the task (Wigfield & Eccles, 2002). In Expectancy-Value Theory, task value influences students’ choices, strategies, and effort. This influence should then also impact student achievement (Wigfield & Eccles, 2000). Past research has proven a positive correlation between task value and academic achievement (Malka & Convington, 2005; Wigfield & Eccles, 2000). Malka and Covington (2005) found students’ achievement increased as their understanding of the utility value of completing a math task was realized. The authors specifically studied perceived instrumentality (PI), which states that “the perception that
outcomes in a specific course are instrumental to attaining valued future goals” (Malka and Covington, 2005, pp.67). They found that “PI had a significant positive main effect; $\beta = .28$, $p < 0.05$; replicating the finding that PI accounts for unique variance in graded performance independently of the achievement goals.” (Malka and Covington, 2005, pp.75).

**Task Value and Educational Expectations**

Tang, Pan, & Newmeyer (2008) studied high school students’ career development process by applying Social Cognitive Career Development Theory “to examine the relationship among learning experience, gender, career self-efficacy, outcome expectation, vocational interests, and career aspiration” (p. 287). In the study, they found a positive link between career aspiration and career task value (Tang et al., 2008). Far less emphases have been placed on the effect of task value on educational expectation. The present study did not test the impact of task value on educational expectation. Rather it looked at both variables individually to determine significance on final outcomes in college algebra. Findings showed that educational expectancy was a significant factor in predicting College Algebra outcomes. Task value was not significant in predicting outcomes.

**Conclusion**

The literature included in above review forms a conceptual framework (Figure 2) which guided this study from development to implementation. The framework shows how the variables interact to form one’s motivation to succeed and have success or failure in college Algebra. The top of the figure shows the participants and their demographic attributes. Moving either left or right the reader will see three of the main independent variables in the study: self-efficacy, intrinsic value, and utility value. Student self-efficacy is the key component in one’s
ability beliefs, the learner’s belief that they can succeed in math related activities. Ability beliefs determine expectancies for success in college (Wigfield & Eccles, 2000).

Intrinsic value and utility value form students perceived benefit of learning, these are direct and indirect benefits of learning math achievement (Malka & Convington, 2005; Wigfield & Eccles, 2000). The perceived benefit determines the overall value an individual places on learning. Student values and expectancies together determine one’s overall motivation to learn and have success in college level coursework. In this study, those courses represent corequisite math and College Algebra. Finally, success in co-requisite coursework outcomes feed into the dependent variable, College algebra outcomes.

FIG. 2 Conceptual Framework
CHAPTER 3: Methodology

The new corequisite model of remedial education in mathematics needed to be studied to further understand the factors that contribute to the success of students who lack the proper skill set to succeed in College Algebra. Student’s motivation to succeed in College Algebra coupled with courses designed to support students have been shown to be valid predictors of math outcomes (Wigfield, & Eccles, 1992; Wigfield & Eccles, 2000). With also taking race and gender into consideration, this study helps to inform institutions about the effectiveness of the corequisite model and also provide insight on services that can be put in place that cater to the populations of students who are in need of extra intervention strategies to succeed in College Algebra.

Expectancy-Value Theory (EVT) combines factors from various motivational theories into sub-sections of student motivation that are clearly defined and easy to measure and understand. Expectancy-Value Theory provides a roadmap to understanding student motivation and achievement that fits in with the scope and methodology of the present quantitative study.

Research Questions

4. **Research Question One (RQ1):** Do students’ perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations predict success in College Algebra?

*Null hypothesis one (H01):* Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have no impact on outcomes in College Algebra.

*Alternate hypothesis one (H01):* Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have a significant impact on outcomes in College Algebra.
5. **Research Question Two (RQ2):** Does successful completion of a corequisite mathematics course accurately predict passing scores for students enrolled in College Algebra?

*Null hypothesis two (H02):* Success in College Algebra is not impacted significantly by successful completion of a corequisite math course.

*Alternate hypothesis two (H02):* Success in corequisite coursework has a significant impact on performance in College Algebra.

6. **Research Question Three (RQ3):** Are race and gender statistically significant factors in relation to outcomes in College Algebra?

*Null hypothesis one (H03):* Race and gender have no impact on success rates for students in College Algebra.

*Alternate hypothesis two (H03):* Race and gender have a significant impact on success rates for students in College Algebra.

**Expectancy-Value Theory: Rationale for Use**

Motivation has been defined as the cognitive process of initiating and sustaining behavior to attain a specific goal or goals (Pintrich & Schunk, 2002). Motivation can be explained by factors such as expectancy-value, intrinsic/extrinsic motivation, self-efficacy, and goals that motivate students to use strategies to control behavior and succeed (Wolters, 1999, 2003). Achievement Motivation is an essential factor in relation to academic success and degree completion (Wigfield & Eccles, 2002). There are many motivation theories that attempt to explain student success, but the Expectancy-Value Model of achievement motivation has been proven to be a valid indicator of student achievement and success through rigorous research and testing (Eccles, Wong, & Peck, 2006; Wigfield & Eccles, 2000). The Expectancy-Value Model
is a valued framework and adds to achievement motivation theory by incorporating motivational concepts such as: ability beliefs, expectancies for success, and subjective task values. The three components of the model help researchers to understand why some students are successful in certain tasks while others are not. Understanding the three crucial constructs of the model and how they impact student’s grades in College Algebra was a key focus of this study. This study attempted to determine if students’ motivation, self-belief and confidence in their own ability to learn, directly affected outcomes in College Algebra. The study also looked at students enrolled in support programs designed to expedite learning in College Algebra and how those programs impacted College Algebra outcomes.

**Ability Beliefs**

Ability beliefs have been defined as an individual’s perception of their own competence in a specific subject or activity (Wigfield & Eccles, 2000). Weiner (1985) suggested students generally believe they had little control over their own ability and these individual beliefs played a major role in motivation and success of individuals completing a task. Positive motivational consequences result from attributing success to ability and negative consequences result from negative self-belief in ability. Students taking College Algebra courses were surveyed about their ability beliefs to further understand why some students are successful and why others struggle.

**Expectancy Beliefs**

Expectancies for success can be defined as beliefs a person has about how they will perform on a certain task (Eccles et al., 1983). Expectancy beliefs focus on individual’s belief of future success while ability beliefs are focused on present ability (Wigfield & Eccles, 2000). Students’ beliefs about their future college success was gathered and tested to provide another indicator for College Algebra outcomes.
Achievement Value

The components of achievement value include attainment value or importance, intrinsic value, utility value, and cost (Wigfield & Eccles, 1992). Attainment value refers to an individual’s perception of how important it is to succeed on a given task and that perception helps to determine persistence. Intrinsic value refers to how much and individual enjoys an activity. Utility value refers to how the task relates to future goals, and cost refers to negative ramifications of completing the task. How much an individual values the task will have a positive or negative effect on the effort put forth on a given task. Understanding how students value math will help administrators develop programming geared at increasing students value perceptions and in turn improve success rates in College Algebra courses.

Gender-Based Differences in Math Achievement

Expectancy-Value Theory (Eccles, 2009) suggests motivation and achievement are influenced by gendered socialization experiences. Although there is no gender difference in math task value, females have a lower expectancy in math compared to males (Guo et al., 2015). Gender differences in Expectancy-Value was measured to show effects on student success in College Algebra and determine if lower expectancy has a negative effect on final grades.

Setting

Research participants participating in the present study were recruited from two public four-year universities in southern Louisiana. Originally a third institution was selected to participate, but the institutions Institutional Review Board failed to respond to the request to survey students. The third university was removed from the study after multiple attempts of contact without reply. The universities in the study were chosen because of their proximity to the researcher and their corequisite math option for students who have lower-than-required ACT and
SAT scores. The University of New Orleans (UNO) is a public, urban institution that was founded in 1958. The university offers nearly 50 areas of study for undergraduates and more than 40 programs for graduate students. Students surveyed at UNO were enrolled in MATH 1115, College Algebra, which covers real numbers and equations, functions, polynomial functions and graphs, exponential and logarithmic functions. Some participants were also enrolled in MATH 1003, Applied Algebra Supplemental Support, which covers factoring, graphing and applications of mathematics to real-world problems, functions and equations, mathematical notation, and critical thinking. MATH 1003 is part of the universities’ Privateer Pathways Program, which is a corequisite designed for students with low ACT or SAT scores who need additional academic support.

The second campus, Southeastern Louisiana University (SELU), is a public, rural institution that was founded in 1925. The university offers over 150 undergraduate, graduate, and certification programs. Students surveyed at SELU were enrolled in MATH 151, College Algebra with Fundamentals, which covers linear, polynomial, rational, exponential, and logarithmic functions, as well as other algebra fundamentals. Some participants were also enrolled in MATH 92, Transitional Math, which is designed as a corequisite to prepare students for College Algebra.

Population

The population of the study consisted of college students enrolled in College Algebra. A proportion of the study participants did not meet full admission requirements to be admitted fully into the universities. At both institutions, corequisite programming allows students who fail to meet the minimum math placement criteria for admission to be admitted to the universities provisionally if they agree to enter the corequisite program, which allows them to take a College
Algebra course while simultaneously taking a corequisite course designed to support students with math deficiencies.

Underprepared students entering college often lack the skills and motivational strategies to pass College Algebra (Collins, 2013). Over 50% of students are entering college in need of math remediation and over half of those students will quit within weeks of enrolling because of low perceived self-efficacy in math or because remedial coursework has nothing to do with their overall academic goals, which may affect perceived task value (Silva & White, 2013). The corequisite programs give students the opportunity to enroll directly into a College Algebra course with supports in place that may positively affect student self-efficacy, and a corequisite course that counts as degree credit, which could positively influence students’ task value. This new population of students was studied to see if increased motivational factors predict grades in College Algebra.

The population consisted of students enrolled in College Algebra, with some of those students enrolled in a corequisite math course. The target population was college students from diverse socioeconomic backgrounds and races. Only students enrolled in the College Algebra were eligible for the study. The sample size for the study was calculated based on the ~700 students enrolled in the College Algebra at both institutions in the spring 2020 semester. The final sample size was n~175 and all individuals enrolled in College Algebra were asked to participate in the study.

Data Collection

Data collected for the study included student’s corequisite grades, gender, race, and motivational factors such as self-efficacy, utility value, intrinsic value, and educational expectation. Each independent variable has been shown to have a significant impact on student
motivation and eventual success in college math coursework (Byrnes, 2003; Eccles, 2011; Koller et al., 2001; Wigfield & Eccles, 2000). Existing data (gender, and race) and motivational factors were assessed using a questionnaire. Working with the Office of Institutional Research at the institutions, the researcher requested a list, including email addresses, of all students enrolled in the classes being studied. The researcher, via email using an online survey software program, administered the survey. Survey items pertaining to motivation and demographic factors will serve as prediction variables for success or failure in College Algebra. Course grades in College Algebra and corequisite coursework were obtained from the Office of Institutional Research at each institution at the end of each semester once the student’s grades were posted.

**Instrument**

Motivational questions used in the study were taken from the Educational Longitudinal Study: 2002 (ELS, 2002). Eleven Likert-type items addressing student motivation were administered to students to assess self-efficacy, utility value, intrinsic value and educational expectation (See Appendix A). The items chosen for the study were adapted from the Program for International Assessment: 2000 and have been shown to have acceptable psychometric properties (Adams & Wu, 2002). Wang (2011) adapted the ELS: 2002 using these eleven items to study students’ course taking patterns in college math. Items from ELS: 2002 are consistent with Bandura’s definition of self-efficacy, where efficacy beliefs are specific to an individual topic in a particular situation (Bandura, 1997).

**Independent Variables**

The independent variables chosen for the study directly correlate to the two main components of EVT, expectancy and value. The present study was designed to examine the validity of three theoretical hypothesis examining expectancy-value variables, grades in
corequisite coursework, and demographic variables and their impact on course performance in College Algebra. The theoretical hypotheses are (1) Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have a significant impact on outcomes in College Algebra, (2) Success in corequisite coursework has a significant impact on performance in College Algebra, and (3) Race and gender have a significant impact on success rates for students in College Algebra. Four independent variables, self-efficacy, utility value, intrinsic value, and educational expectation were used to test theoretical hypothesis one. Outcomes in the corequisite math course are used to test hypothesis two; and race and gender variables are used to test hypothesis three.

FIG. 3 Independent and Dependent Variables

**Self-efficacy.** Questions about self-efficacy in math assessed student’s perceptions of their capacity for academic achievement in mathematics. Five items from ELS: 2002 are used for
the assessment of student self-efficacy. The questions are rated on a four-point scale and answers range from 1-Almost never to 4-Almost always and include questions like “I am confident that I can do an excellent job on my math tests.” Wang (2011), found in a principle component analysis of the self-efficacy findings, the factor loadings ranged from .87 to .90 which indicated acceptable validity for the variable.

Utility value. Questions about utility value in learning assessed how useful students perceive learning. Three items from ELS: 2002 were used for the assessment of student utility value. The questions were rated on a four-point scale and answers range from 1-Almost never to 4-Almost always and include questions like “I study to increase my job opportunities.” Wang (2011), found in a principle component analysis of the self-efficacy findings, the factor loadings ranged from .87 to .90 which indicated acceptable validity for the variable. Questions pertaining to utility value do not focus directly on math; the questions assess the utility value of general learning.

Intrinsic value. Intrinsic value questions assessed students’ inherent enjoyment of math. Three items from ELS:2002 were used for the assessment of student utility value. The questions are rated on a four-point scale and answers range from 1-Strongly agree to 4-Strongly disagree and include questions like “When I do math, I sometimes get totally absorbed.” Wang (2011), found in a principle component analysis of the self-efficacy findings, the factor loadings ranged from .78 to .85 which indicated acceptable validity for the variable.

Educational expectation. Educational expectation questions assessed students’ self-perception of the educational level they see themselves obtaining. One question from the ELS: 2002 was used to measure educational expectation: “As things stand now, how far in school do you think you will get.” In its original form the question was rated on a nine-point scale ranging
from 1-less than a high school graduation to 9-Obtain a Ph.D., M.D. or other advanced degree. For the purposes of this study the question is rated on a 3-point scale: 0-I do not expect to graduate college, 1-I expect to graduate from college, and 2-I plan on earning an advanced degree.

**Grade in corequisite math course.** Grades in the corequisite math course were collected at the end of the spring 2020, Summer 2020, and Fall 2020 semesters. Student grades ranged from “0” (Fail) to “1” (Pass) and were used as a prediction variable for the outcome variable (Pass/Fail in College Algebra). Students who completed College Algebra that did not complete the survey were not taken into consideration in the study.

**Gender.** Past studies have examined gender differences in motivation and have reported mixed results (Green & Foster, 1986; Davis, Winsler, & Middleton, 2006). Male college students have been shown to have a higher likelihood of adhering to performance goals and increase mastery goal orientation over the course of a semester, while female student’s mastery goal orientation has been shown to decrease over the course of a semester (Cavallo, Potter, & Rozman, 2004). Other studies (Davis et al., 2006), have shown female college students outperform men as a group and historically have more extrinsic rewards for success. Self-efficacy of students has been shown to vary by age and subject matter, but it is clear male students report significantly higher academic self-efficacy than female college students (Cavello et al., 2004). In the present study, students’ gender was identified and matched to motivational factors in an attempt to show differences in motivation and math outcomes. Gender was collected using the demographic section of the survey and used as an independent variable to predict success in College Algebra. Gender was coded as “0” (male) and “1” (female).
Race. Motivation is key to the early and continued success of college students and perhaps even greater for minority groups. Racial and ethnic minorities have been shown to be overrepresented in remedial math coursework (Snyder, 2015). This overrepresentation was studied to see if motivational differences exist between white and non-white students and if those differences impact math outcomes. Race was collected using the demographic section of the survey and used as an independent variable to predict success in College Algebra. For the purposes of this study race was coded as “0” (white) and “1” (non-white).

Dependent Variable: Pass/Fail College Algebra

The Participants were enrolled in College Algebra at UNO and SELU in the spring 2020, Summer 2020, and Fall 2020 semesters. Their final grades in College Algebra were obtained at the end of each semester. For the purpose of this study a grade of A, B, or C was considered a passing grade and D or F was considered a failing grade. In addition, students who withdraw from the course (W) were grouped in the failing category along with students earning D or F in the course. This practice is consistent with past research on remedial education (Bahr, 2013). If any student received an incomplete (I), they were removed from the data set. Without knowing the circumstances surrounding each student’s incomplete grade, it was not possible to determine if the students would pass or fail or fail the course.

Research Design

The sample consists of students admitted to the universities for the spring 2020, Summer 2020, and Fall 2020 semesters, who were enrolled in College Algebra. Originally the data collection was to take place in one semester, Spring 2020. Because of the COVID pandemic institutions only offered classes online and many students chose not to attend making it difficult to gather the needed number of participants for the study. Because of this, data collection was
extended for one full year. Although it was believed that the full number of participants would be
gathered in the Spring 2020 semester, only 52 participants completed the survey and filled out
conformed consent form which extended the collection to summer 2020 and fall 2020 semesters.
In the summer semester the survey was sent to 97 possible participants and only three students
completed the survey. Finally, in the fall 2020 semester the survey was sent to 1791 possible
participants and 119 completed the survey, Over the three-semester period a total of 174 students
filled out the survey and agreed to participate in the study.

TABLE 0. Survey Response Rate by Semester

<table>
<thead>
<tr>
<th>Semester</th>
<th>UNO n sent</th>
<th>UNO completed</th>
<th>%</th>
<th>SELU n sent</th>
<th>SELU completed</th>
<th>%</th>
<th>ALL n sent</th>
<th>ALL completed</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2020</td>
<td>186</td>
<td>15</td>
<td>8%</td>
<td>577</td>
<td>38</td>
<td>7%</td>
<td>763</td>
<td>53</td>
<td>7%</td>
</tr>
<tr>
<td>Summer 2020</td>
<td>23</td>
<td>1</td>
<td>4%</td>
<td>74</td>
<td>2</td>
<td>3%</td>
<td>97</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>864</td>
<td>62</td>
<td>7%</td>
<td>927</td>
<td>56</td>
<td>6%</td>
<td>1791</td>
<td>118</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>1073</td>
<td>78</td>
<td>7%</td>
<td>1578</td>
<td>96</td>
<td>6%</td>
<td>2651</td>
<td>174</td>
<td>7%</td>
</tr>
</tbody>
</table>

Some participants did not meet full admission requirements and were required to enroll in
a corequisite math course along with their college math requirement. During the course of the
semesters, participants were given a survey to identify their math self-efficacy, intrinsic value,
task value, and educational expectations. The survey also asked the participants to identify their
race and gender. The survey was administered by the researcher via email using an online survey
software program. It was originally planned that the researcher would visit classrooms with
paper surveys if email communication was not sufficient, but courses offered in 2020 were
mostly on-line making this task impossible. Finally, once grades were posted for the Spring
2020, Summer 2020, and Fall 2020 semesters, the grades (Pass/Fail) were collected for College
Algebra and corequisite coursework. Final grades in College Algebra served as the outcome
variable for the study.
Data Cleaning and Transformation

The data obtained from the survey (race and gender) and the students’ perceptions about math motivation, educational expectancy, as well as the grade for the corequisite course served as independent variables used to predict the outcome of College Algebra course. After all data was collected, it was analyzed to ensure that the set does not contain errors or outliers that could result in erroneous results. Invalid data was detected and then corrected in an attempt to identify typing errors in data entry, non-applicable or blank options coded as “0”, data entered in the wrong column, coding errors, and data collection errors (Verma, 2012).

A massive data transformation was necessary to convert text to numbers before the regression analysis in SPSS was possible. The Universities provided the full grade breakdown for participants enrolled in College Algebra and corequisite math. The researcher transformed A, B, C, and P grades to “1” and D, F, and W grades to “0”. Similar transformations were necessary for race and gender. Race was converted to non-white “1” and white “0” and gender was converted to male “0” and female “1”. All survey responses for self-efficacy, utility value, intrinsic value, and educational expectation were converted from text (i.e. almost never-almost always) to numbers, 1-4. The survey included multiple questions for each variable (self-efficacy, utility value, intrinsic value, and educational expectation). Once the data was transformed the researcher used excel to calculate the range score for each participant for the four variables. Those scores were used for the analysis.

**Strategy and Measurement**

Binary logistic regression was used to determine the influence of the independent variables (grade in corequisite course, self-efficacy, utility value, intrinsic value, educational expectation, gender, and race) on the dependent variable (outcome of College Algebra). Binary
logistic regression is an extension of linear regression; the main difference between the two is binary logistic regression relies on a dichotomous dependent variable (Creswell, 2013; Field, 2013; Wuensch, 2014). In the case of this study, the outcome variable criteria was pass/fail. The present study used binary logistic regression to: (1) determine if success in a corequisite course is a significant predictor of student success in College Algebra, (2) determine if motivational factors (self-efficacy, utility value, and intrinsic value) are significant predictors of success in College Algebra, (3) determine if educational expectation is a significant predictors of success in College Algebra and (4) develop predictive models based on gender and race. Before the main regression analysis, descriptive statistics including mean, standard deviation and frequency for all variables was reported. Because the present study is focusing on factors predicting success in College Algebra, binary logistic regression was the best fit to analyze the data (Osborne, 2011, 2014).
CHAPTER 4: Findings

Following the data collection, cleaning, and transformation, the researcher calculated descriptive statistics for the population as a whole and by each institution respectively. Following the analysis of descriptive statistics, the researcher computed two binary logistic regression models. The BLR reports included overall model fit, Nagelkerke R-Squared, chi-squared, beta coefficients, and p values ≤ .05. The full model examined the probability of passing College Algebra based on all independent variables in the study. Model two examined the probability of passing of only the participants that enrolled in and completed the corequisite pathway. The remainder of this chapter will focus on analysis of the collected descriptive statistics and the analysis of both binary logistic regression models.

Research Questions

1. **Research Question One (RQ1):** Do students’ perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations predict success in College Algebra?

   *Null hypothesis one (H01):* Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have no impact on outcomes in College Algebra.

   *Alternate hypothesis one (H01):* Perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations have a significant impact on outcomes in College Algebra.

2. **Research Question Two (RQ2):** Does successful completion of a corequisite mathematics course accurately predict passing scores for students enrolled in College Algebra?

   *Null hypothesis two (H02):* Success in College Algebra is not impacted significantly by successful completion of a corequisite math course.
Alternate hypothesis two (H02): Success in corequisite coursework has a significant impact on performance in College Algebra.

3. Research Question Three (RQ3): Are race and gender statistically significant factors in relation to outcomes in College Algebra?

Null hypothesis one (H03): Race and gender have no impact on success rates for students in College Algebra.

Alternate hypothesis two (H03): Race and gender have a significant impact on success rates for students in College Algebra.

Descriptive Statistics

Descriptive statistics for the present study were obtained from the University of New Orleans and Southeastern Louisiana University in the Spring 2020, Summer 2020, and Fall 2020 semesters. A combination of university provided data and survey data was used to gather the independent and dependent variables. Survey data provided the independent variables of: Race/ethnicity, sex, self-efficacy, utility value, intrinsic value, and educational expectation. University obtained data provided an additional independent variable: grade in corequisite math course and the dependent variable: grade in College Algebra.

Total participants: campus breakdown

The total population consisted of 174 participants. Participants were all enrolled in College Algebra at The University of New Orleans and Southeastern Louisiana University. Of the 174 participants, 68% identified as female and 32% identified as male. Non-white students made up 45% of the population compared to 55% white. Of the 174 participants, 49 (28%) were enrolled in the supplemental course along with College Algebra.
UNO participation consisted of 77 participants, 56% identified as female while 44% identified as male. Non-white students made up 60% of the population compared to 40% white. Of the 77 participants, 31 (40%) were enrolled in the supplemental course along with College Algebra. Comparatively, The University of New Orleans population had much greater non-white (60%) and male (44%) participation rate that Southeastern Louisiana university as shown below.

SELU participation consisted of 97 participants, 78% identified as female while 22% identified as male. Non-white students made up 34% of the population compared to 66% white. Of the 77 participants, 18 (19%) were enrolled in the supplemental course along with College Algebra.

Table 1. General Statistics

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>UNO N</th>
<th>UNO %</th>
<th>UNO Supplemental</th>
<th>UNO Supplemental %</th>
<th>SELU N</th>
<th>SELU %</th>
<th>SELU Supplemental</th>
<th>SELU Supplemental %</th>
<th>All N</th>
<th>All %</th>
<th>All Supplemental</th>
<th>All Supplemental %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>34</td>
<td>44%</td>
<td>12</td>
<td>16%</td>
<td>21</td>
<td>22%</td>
<td>4</td>
<td>4%</td>
<td>55</td>
<td>32%</td>
<td>16</td>
<td>9%</td>
</tr>
<tr>
<td>Female</td>
<td>43</td>
<td>56%</td>
<td>19</td>
<td>25%</td>
<td>76</td>
<td>78%</td>
<td>14</td>
<td>14%</td>
<td>119</td>
<td>68%</td>
<td>33</td>
<td>19%</td>
</tr>
<tr>
<td>Non-White</td>
<td>46</td>
<td>60%</td>
<td>23</td>
<td>30%</td>
<td>33</td>
<td>34%</td>
<td>12</td>
<td>12%</td>
<td>79</td>
<td>45%</td>
<td>35</td>
<td>20%</td>
</tr>
<tr>
<td>White</td>
<td>31</td>
<td>40%</td>
<td>8</td>
<td>10%</td>
<td>64</td>
<td>66%</td>
<td>6</td>
<td>6%</td>
<td>95</td>
<td>55%</td>
<td>14</td>
<td>8%</td>
</tr>
</tbody>
</table>

Descriptive Statistics Across All Independent Variables

Race/Ethnicity. Although race/ethnicity was combined into a single binary variable (white or non-white) for the binary logistic regression, descriptive statistics were collected and computed for all race/ethnicity categories. Among all participants (174), the majority of participants were White. Of the 174 participants 54.6% were white, 29.31% were Black or African American, 7.47% were Hispanic/Latino of any race, 3.45% were two or more races, 2.87% were Asian, 1.72% were American Indian or Alaska Native, 0.57% were unspecified. Of the entire
population, 49 (28.16% of all participants) students enrolled in the corequisite course, 12.64%
were Black or African American, 8.05% were white, 4.02% were Hispanic/Latino of any race,
1.15% were American Indian or Alaska Native, 1.15% were two or more races, 0.57% were
Asian, and 0.57% were unspecified.

When looking at the White or Non-White breakdown 54.6% of all participants were
white and 44.83% of all participants were Non-White, with 0.57% not responding. When
comparing to participants in corequisite coursework (28.16%) we see that only 8.05% were
White and 19.54% were Non-White, with 0.57% not responding.

Table 2. All Race/Ethnicity

<table>
<thead>
<tr>
<th>All Race/Ethnicity</th>
<th>All Total</th>
<th>All total %</th>
<th>All enrolled in Supplemental</th>
<th>% All in Supplemental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>174</td>
<td>100.00%</td>
<td>49</td>
<td>28.16%</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>3</td>
<td>1.72%</td>
<td>2</td>
<td>1.15%</td>
</tr>
<tr>
<td>Asian</td>
<td>5</td>
<td>2.87%</td>
<td>1</td>
<td>0.57%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>51</td>
<td>29.31%</td>
<td>22</td>
<td>12.64%</td>
</tr>
<tr>
<td>Hispanic/Latino of any race</td>
<td>13</td>
<td>7.47%</td>
<td>7</td>
<td>4.02%</td>
</tr>
<tr>
<td>Not Specified</td>
<td>1</td>
<td>0.57%</td>
<td>1</td>
<td>0.57%</td>
</tr>
<tr>
<td>Two or more races</td>
<td>6</td>
<td>3.45%</td>
<td>2</td>
<td>1.15%</td>
</tr>
<tr>
<td>White</td>
<td>95</td>
<td>54.60%</td>
<td>14</td>
<td>8.05%</td>
</tr>
</tbody>
</table>

*University of New Orleans Race Ethnicity breakdown.* In comparison to the total
population UNO participants were slightly more diverse. Of the 77 UNO participants 40.26%
were White, 33.77% were Black or African American, 9.09% were Hispanic/Latino of any race,
6.49% were Asian, 6.49% were two or more races, 2.6% were American Indian or Alaska
Native, and 1.3% did not specify. Of the UNO population, 31 (40.26% of all UNO participants)
students enrolled in the corequisite course, 19.48% were Black or African American, 10.39%
were White, 2.6% were American Indian or Alaska Native, 2.6% were Hispanic/Latino of any race, 2.6% were two or more races, 1.3% were Asian, and 1.3% were unspecified.

When looking at the White or Non-White breakdown of all UNO participants, 40.26% were white compared to 58.44% non-white with 1.3% not specified. When comparing to UNO participants in corequisite coursework we see that only 10.39% were White and 28.57% were Non-White, with 1.3% not responding.

Table 3. UNO Race/Ethnicity

<table>
<thead>
<tr>
<th>UNO Race/Ethnicity</th>
<th>All UNO</th>
<th>Total UNO %</th>
<th>UNO Enrolled in Supplemental</th>
<th>% UNO in Supplemental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>77</td>
<td>100.00%</td>
<td>31</td>
<td>40.26%</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>2</td>
<td>2.60%</td>
<td>2</td>
<td>2.60%</td>
</tr>
<tr>
<td>Asian</td>
<td>5</td>
<td>6.49%</td>
<td>1</td>
<td>1.30%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>26</td>
<td>33.77%</td>
<td>15</td>
<td>19.48%</td>
</tr>
<tr>
<td>Hispanic/Latino of any race</td>
<td>7</td>
<td>9.09%</td>
<td>2</td>
<td>2.60%</td>
</tr>
<tr>
<td>Not Specified</td>
<td>1</td>
<td>1.30%</td>
<td>1</td>
<td>1.30%</td>
</tr>
<tr>
<td>Two or more races</td>
<td>5</td>
<td>6.49%</td>
<td>2</td>
<td>2.60%</td>
</tr>
<tr>
<td>White</td>
<td>31</td>
<td>40.26%</td>
<td>8</td>
<td>10.39%</td>
</tr>
</tbody>
</table>

Southeastern Louisiana University Race Ethnicity breakdown. When looking at SELU participants in comparison to the total population we see a much higher participation rate from White participants. Of the 97 SELU participants 65.98% were White, 25.77% were Black or African American, 6.19% were Hispanic/Latino of any race, 1.03% were American Indian or Alaska Native, and 1.03% were two or more races. SELU had zero Asian participants. Of the SELU population, 18 (18.56% of all SELU participants) SELU students enrolled in the corequisite course, 7.22% were Black or African American, 6.19% were White, and 5.15% were Hispanic/Latino of any race. When looking at the White or Non-White breakdown of all SELU
participants, 65.98% were White compared to 34.02% Non-White. When comparing to SELU participants in corequisite coursework we see that only 6.19% were White and 12.37% were Non-White.

Table 4. SELU Race/Ethnicity

<table>
<thead>
<tr>
<th>SELU Race/Ethnicity</th>
<th>All SELU</th>
<th>Total SELU %</th>
<th>SELU Enrolled in Supplemental</th>
<th>% SELU in Supplemental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>97</td>
<td>100.00%</td>
<td>18</td>
<td>18.56%</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>1</td>
<td>1.03%</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>0.00%</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>25</td>
<td>25.77%</td>
<td>7</td>
<td>7.22%</td>
</tr>
<tr>
<td>Hispanic/Latino of any race</td>
<td>6</td>
<td>6.19%</td>
<td>5</td>
<td>5.15%</td>
</tr>
<tr>
<td>Not Specified</td>
<td>0</td>
<td>0.00%</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Two or more races</td>
<td>1</td>
<td>1.03%</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>White</td>
<td>64</td>
<td>65.98%</td>
<td>6</td>
<td>6.19%</td>
</tr>
</tbody>
</table>

**Gender.** Females comprised the majority of the study participants. Of the 174 participants 119 (68.39%) identified as female and 55 (31.61%) identified as male. A stated above a total of 49 (28.16%) of all participants were enrolled in College Algebra as well as the accompanying corequisite course. Of the 49 participants, 33 (18.97%) identified as female and 16 (9.2%) identified as male.

Table 5. All Gender Breakdown

<table>
<thead>
<tr>
<th>All Gender</th>
<th>All Total</th>
<th>All total %</th>
<th>All enrolled in Supplemental</th>
<th>% All in Supplemental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>174</td>
<td>100%</td>
<td>49</td>
<td>28.16%</td>
</tr>
<tr>
<td>Male</td>
<td>55</td>
<td>31.61%</td>
<td>16</td>
<td>9.20%</td>
</tr>
<tr>
<td>Female</td>
<td>119</td>
<td>68.39%</td>
<td>33</td>
<td>18.97%</td>
</tr>
</tbody>
</table>
University of New Orleans gender breakdown. The gender breakdown from the University of New Orleans. The gender breakdown at the University of New Orleans had a larger percentage of male participants than the study population. Of the 77 UNO participants 43 (55.84%) identified as female and 34 (44.16%) identified as male. UNO also had a greater number of participants enrolled in both College Algebra as well as the corequisite companion class. A total of 31 (40%) of participants were enrolled in both courses with 19 (24.68%) identifying as female and 12 (15.58%) identifying as male.

Table 6. UNO Gender Breakdown

<table>
<thead>
<tr>
<th>UNO Gender</th>
<th>All UNO</th>
<th>Total UNO %</th>
<th>UNO Enrolled in Supplemental</th>
<th>% UNO in Supplemental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>77</td>
<td>100%</td>
<td>31</td>
<td>40.26%</td>
</tr>
<tr>
<td>Male</td>
<td>34</td>
<td>44.16%</td>
<td>12</td>
<td>15.58%</td>
</tr>
<tr>
<td>Female</td>
<td>43</td>
<td>55.84%</td>
<td>19</td>
<td>24.68%</td>
</tr>
</tbody>
</table>

Southeastern Louisiana University gender breakdown. The gender breakdown at the SELU had a larger female population. Of the 97 SELU participants 76 (78.35%) identified as female and 21 (21.65%) identified as male. SELU also had a lower number of participants enrolled in both College Algebra as well as the corequisite companion class. A total of 18 (18.56%) of participants were enrolled in both courses with 14 (14.43%) identifying as female and 4 (4.12%) identifying as male.

Table 7. SELU Gender Breakdown

<table>
<thead>
<tr>
<th>SELU Gender</th>
<th>All SELU</th>
<th>Total SELU %</th>
<th>SELU Enrolled in Supplemental</th>
<th>% SELU in Supplemental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>97</td>
<td>100%</td>
<td>18</td>
<td>18.56%</td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>21.65%</td>
<td>4</td>
<td>4.12%</td>
</tr>
<tr>
<td>Female</td>
<td>76</td>
<td>78.35%</td>
<td>14</td>
<td>14.43%</td>
</tr>
</tbody>
</table>
**Grade in corequisite course.** Grades in corequisite coursework ranged from P to F for the all of the study participants. Students who dropped the class before the designated institutions scheduled drop date received a W (Withdrawal). This constituted 6% of all study participants. For the purposes of this study grades were considered on a Pass/Fail basis. Grades of A, B, C, and P were grouped together as Passing and D, F, and W (Withdrawal) were grouped as Failing.

*University of New Orleans corequisite grades.* Of the 77 participants from the University of New Orleans 31 were enrolled in MATH 1015 (supplemental course to College Algebra). This constitutes 40% of the UNO participants and 18% of all study participants. Of the 31 students 22 (70.97%) earned a P in the course and nine (29.03%) earned an F. No UNO students withdrew from the course before the institution’s designated drop date. When comparing females and males in the corequisite course we see that 78.95% of females enrolled, passed the course compared to 58.33% of males. White participants had slightly greater success than Non-White students with 75% of white participants passing the class compared to 68.18% for Non-White participants.

Table 8. UNO Corequisite Grade

<table>
<thead>
<tr>
<th>UNO Corequisite Grade</th>
<th>UNO Enrolled in Corequisite N=31</th>
<th>%</th>
<th>Male %</th>
<th>Female %</th>
<th>% White</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>22</td>
<td>70.97%</td>
<td>58.33%</td>
<td>78.95%</td>
<td>75.00%</td>
<td>68.18%</td>
</tr>
<tr>
<td>FAIL</td>
<td>9</td>
<td>29.03%</td>
<td>41.67%</td>
<td>21.05%</td>
<td>25.00%</td>
<td>31.82%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>31</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Southeastern Louisiana University corequisite grades.* Of the 97 participants from SELU 18 were enrolled in MATH 115L, Essentials of College Mathematics Lab, which is a supplemental instruction/laboratory course to accompany MATH 115. This constitutes 19% of SELU participants and 10% of all study participants. Of the 18 participants at SELU 12
(66.67%) earned a P in the course, six (33.33%) earned an F. When comparing females and males in the corequisite course we see that 71.43% of females enrolled passed the course compared to 50% of males. White participants had greater success than Non-White students with 83.33% of white participants passing the class compared to 58.33% for Non-White participants.

Table 9. SELU Corequisite Grade

<table>
<thead>
<tr>
<th>SELU Corequisite Grade</th>
<th>SELU N= 18</th>
<th>%</th>
<th>Male %</th>
<th>Female %</th>
<th>% White</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>12</td>
<td>66.67%</td>
<td>50.00%</td>
<td>71.43%</td>
<td>83.33%</td>
<td>58%</td>
</tr>
<tr>
<td>FAIL</td>
<td>6</td>
<td>33.33%</td>
<td>50.00%</td>
<td>28.57%</td>
<td>16.67%</td>
<td>42%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>18</td>
<td>100.00%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Corequisite from all participants and conclusions. In total, 49 (28%) participants were enrolled in both College Algebra and the accompanying supplemental course. Of all participants enrolled in the supplemental course 34 (69.39%) passed the course while 15 (30.61%) earned a failing grade. When comparing females and males in the corequisite course we see that 75.76% of females enrolled passed the course compared to 56.25% of males. White participants had greater success than Non-White students with 78.57% of white participants passing the class compared to 64.71% for Non-White participants.

Table 10. ALL Corequisite Grade

<table>
<thead>
<tr>
<th>ALL Corequisite Grade</th>
<th>Total N= 49</th>
<th>%</th>
<th>Male %</th>
<th>Female %</th>
<th>% White</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>34</td>
<td>69.39%</td>
<td>56.25%</td>
<td>75.76%</td>
<td>78.57%</td>
<td>64.71%</td>
</tr>
<tr>
<td>FAIL</td>
<td>15</td>
<td>30.61%</td>
<td>43.75%</td>
<td>24.24%</td>
<td>21.43%</td>
<td>35.29%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>49</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
At a glance, the reader can see that although both institutions had a similar number of students enrolled in corequisite coursework (UNO-31, SELU-19), UNO had a considerably higher percentage of participants enrolled in the corequisite course based on all participants from each institution (40% vs 10%). Grade distribution was consistent between both institutions with 70.97% earning P grades at UNO and 66.67% earning P grades at SELU. Participants who earned an F were also consistent between the institutions with 29.03% from UNO and 33.33% from SELU. The higher percentage of participants enrolled in corequisite coursework at UNO, at this point, can only be attributed to the convenience sampling method applied in this study. Basically, more participants who chose to fill out the survey at UNO were enrolled in corequisite coursework in addition to college algebra. But, when taking other factors into account, this statistic can possibly lead to implications for future research which will be discussed in chapter five.

**Self-efficacy.** Academic self-efficacy is an individual’s belief he or she has the capability to successfully complete an academic task (Bandura, 1997). Academic self-efficacy in math can be defined as an individual’s perception or belief of his or her ability to do well in math coursework (Wigfield & Eccles, 2000). Self-efficacy scores on five individual items range from 1-Able to do task, to 4-Almost Always. The SE range could be anywhere between five and 20.

When looking at the entire population of participants the self-efficacy average for all items is 2.46 out of four. Participants scored themselves lowest when answering the question about understanding difficult math material in textbooks (2.14) and highest when evaluating their ability to successfully completing math assignments (2.83). The entire population range is 12.26.
Table 11. ALL Math Self-Efficacy

<table>
<thead>
<tr>
<th>SELF-EFFICACY (SE)</th>
<th>ALL (n=174)</th>
<th>Mean per item</th>
<th>SE Mean Avg (1-4)</th>
<th>SE Range (5-20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm confident that I can do an excellent job on my math tests</td>
<td></td>
<td>2.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm certain I can understand the most difficult material presented in math texts</td>
<td></td>
<td>2.14</td>
<td>2.46</td>
<td>12.26</td>
</tr>
<tr>
<td>I'm confident I can understand the most complex material presented by my math teacher</td>
<td></td>
<td>2.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm confident I can do an excellent job on my math assignments</td>
<td></td>
<td>2.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm certain I can master the skills being taught in my math class</td>
<td></td>
<td>2.65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

University of New Orleans Participant Self-Efficacy. When looking at the UNO participants the self-efficacy average for all items is 2.57 out of four. Slightly higher than the population average. Like all participants, UNO participants scored themselves lowest when answering the question about understanding difficult math material in textbooks (2.22) and highest when evaluating their ability to successfully completing math assignments (2.91). The UNO participant range is 12.81. Once again slightly higher than the population range.

Table 12. UNO Math Self-Efficacy

<table>
<thead>
<tr>
<th>SELF-EFFICACY (SE)</th>
<th>UNO (n=77)</th>
<th>Mean per item</th>
<th>SE Mean Avg (1-4)</th>
<th>SE Range (5-20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm confident that I can do an excellent job on my math tests</td>
<td></td>
<td>2.68</td>
<td>2.57</td>
<td>12.81</td>
</tr>
<tr>
<td>I'm certain I can understand the most difficult material presented in math texts</td>
<td></td>
<td>2.22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Southeastern Louisiana University Participant Self-Efficacy. When looking at the SELU participants the self-efficacy average for all items is 2.37 out of four. Slightly lower that the population average. Unlike all participants, SELU participants scored themselves lowest when answering the question about understanding complex material presented by the math teacher (2.07) and highest when evaluating their ability to successfully completing math assignments (2.77). The SELU participant range is 11.82, slightly lower that the population range.

Table 13. SELU Math Self-Efficacy

<table>
<thead>
<tr>
<th>SELU (n=97)</th>
<th>Mean per item</th>
<th>SE Mean Avg (1-4)</th>
<th>SE Range (5-20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I'm confident that I can do an excellent job on my math tests</td>
<td>2.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm certain I can understand the most difficult material presented in math texts</td>
<td>2.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm confident I can understand the most complex material presented by my math teacher</td>
<td>2.07</td>
<td>2.37</td>
<td>11.82</td>
</tr>
<tr>
<td>I'm confident I can do an excellent job on my math assignments</td>
<td>2.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I'm certain I can master the skills being taught in my math class</td>
<td>2.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Utility value. Utility value has been defined as an individual’s understanding of how current tasks relate to future goals (Wigfield & Eccles, 1992). Utility value scores on three individual items range from 1-Almost Never, to 4-Almost Always. The UV range could be
anywhere between three and 12. When looking at the entire population of participants the UV average for all items is 3.19 out of four. Participants scored themselves lowest when answering the question about increasing job opportunities (3.09) and highest on the question pertaining to their financial future (3.34). all three questions had a mean above 3.0 indicating a high importance in students perceived utility value of studying. The entire population range is 9.51.

Table 14. ALL Utility Value

<table>
<thead>
<tr>
<th>Utility Value (UV)</th>
<th>Mean per item</th>
<th>UV Mean Avg (1-4)</th>
<th>UV Range (3-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL (n=174)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I study to get a good job</td>
<td>3.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I study to increase my job opportunities</td>
<td>3.09</td>
<td>3.19</td>
<td>9.51</td>
</tr>
<tr>
<td>I study to ensure that my future will be financially secure</td>
<td>3.34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

University of New Orleans Participant Utility Value. When looking at the UNO participants alone, the UV average for all items is 3.16 out of four. Slightly lower that the population average. Participants scored themselves lowest when answering the question about studying to get a good job (3.09) and highest on the question pertaining to their financial future (3.34). all three questions had a mean above 3.0 indicating a high importance in UNO students perceived utility value of studying. The entire population range is 9.45. Slightly lower that the population mean range.

Table 15. UNO Utility Value

<table>
<thead>
<tr>
<th>Utility Value (UV)</th>
<th>Mean per item</th>
<th>UV Mean Avg (1-4)</th>
<th>UV Range (3-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNO (n=77)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I study to get a good job</td>
<td>3.05</td>
<td>3.16</td>
<td>9.45</td>
</tr>
<tr>
<td>Utility Value (UV)</td>
<td>Mean per item</td>
<td>UV Mean Avg (1-4)</td>
<td>UV Range (3-12)</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------</td>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>SELU (n=97)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I study to get a good job</td>
<td>3.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I study to increase my job opportunities</td>
<td>3.08</td>
<td></td>
<td>3.21</td>
</tr>
<tr>
<td>I study to ensure that my future will be financially secure</td>
<td>3.35</td>
<td></td>
<td>9.56</td>
</tr>
</tbody>
</table>

**Southeastern Louisiana University Participant Utility Value.** When looking at the SELU participants alone, the UV average for all items is 3.21 out of four. Slightly higher that the population average. Participants scored themselves lowest when answering the question about studying to increase job opportunities (3.08) and highest on the question pertaining to their financial future (3.35). All three questions had a mean above 3.0 indicating a high importance in SELU students perceived utility value of studying. The entire population range is 9.56. Slightly higher that the population mean range.

Table 16. SELU Utility Value

Intrinsic value. Intrinsic value of math has been defined as an individual’s personal enjoyment of math-related activities. (Wigfield & Eccles, 1992). Intrinsic Value scores on three individual items range from 1-Strongly agree, to 4-Strongly disagree. For this variable alone, a lower number indicates a higher percentage of agreement. The IV range could be anywhere between three and 12. When looking at the entire population of participants the IV average for all items is 2.69 out of four. Participants had the strongest agreement when addressing the statement: When I do math, I sometimes get totally absorbed (2.43) and the least agreement.
when addressing the statement: Because doing math is fun, I wouldn't want to give it up (2.95).

All three questions had a mean of 2.7 indicating more disagreement than agreement regarding perceived intrinsic value of math. The entire population range is 8.05.

Table 17. ALL Intrinsic Value

<table>
<thead>
<tr>
<th></th>
<th>Intrinsic Value (IV)</th>
<th>Mean per item</th>
<th>IV Mean Avg (1-4)</th>
<th>IV Range (3-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL (n=174)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When I do math, I sometimes get totally absorbed</td>
<td>2.43</td>
<td>2.69</td>
<td>8.05</td>
<td></td>
</tr>
<tr>
<td>Because doing math is fun, I wouldn't want to give it up</td>
<td>2.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math is important to me personally</td>
<td>2.70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

University of New Orleans Participant Intrinsic Value. When looking at the UNO participants alone, the IV average for all items is 2.58 out of four. Slightly lower than the population mean. Participants had the strongest agreement when addressing the statement: When I do math, I sometimes get totally absorbed (2.45) and the least agreement when addressing the statement: Because doing math is fun, I wouldn't want to give it up (2.79). All three questions had a mean of 2.58 indicating more disagreement than agreement regarding perceived intrinsic value of math. The entire population range is 7.75. Slightly lower than the population mean range.

Table 18. UNO Intrinsic Value

<table>
<thead>
<tr>
<th></th>
<th>Intrinsic Value (IV)</th>
<th>Mean per item</th>
<th>IV Mean Avg (1-4)</th>
<th>IV Range (3-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNO (n=77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When I do math, I sometimes get totally absorbed</td>
<td>2.45</td>
<td>2.58</td>
<td>7.75</td>
<td></td>
</tr>
</tbody>
</table>
Because doing math is fun, I wouldn't want to give it up  2.79
Math is important to me personally  2.51

Southeastern Louisiana University Participant Intrinsic Value. When looking at the
SELU participants alone, the IV average for all items is 2.78 out of four. Slightly higher than the
population mean. Participants had the strongest agreement when addressing the statement: When
I do math, I sometimes get totally absorbed (2.42) the least agreement about the statement:
Because doing math is fun, I wouldn't want to give it up (3.08). All three questions had a mean
of 2.78 indicating more disagreement than agreement regarding perceived intrinsic value of
math. The entire population range is 8.29. Slightly higher than the population mean range.
Table 19. SELU Intrinsic Value

<table>
<thead>
<tr>
<th>Intrinsic Value (IV)</th>
<th>Mean per item</th>
<th>IV Mean Avg (1-4)</th>
<th>IV Range (3-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELU (n=97)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When I do math, I sometimes get totally absorbed</td>
<td>2.42</td>
<td>2.78</td>
<td>8.29</td>
</tr>
<tr>
<td>Because doing math is fun, I wouldn't want to give it up</td>
<td>3.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math is important to me personally</td>
<td>2.85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Educational expectation. Educational expectation refers to students’ perceptions
of their educational possibilities based on their abilities, past performance, and ambitions
(Morgan, 1998). Educational expectation has been proven to be a valid indicator of future
academic achievement (Andres, Adamuti-Trache, Yoon Pidgeon & Thomsen, 2007).
Educational education scores on one individual item range from 0-Don’t Know/Attend college,
but not complete a 4-year degree, to 2-Obtain an Advanced Degree. The IV range could be
anywhere between zero and two. When looking at the entire population of participants the IV
average for the one item the mean is 1.32 out of two. The entire population range is the same at 1.32.

Table 20. ALL Educational Expectation

<table>
<thead>
<tr>
<th>Educational Expectation (EE)</th>
<th>Mean</th>
<th>EE Mean Avg (0-2)</th>
<th>EE Range (0-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL (n=174)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As things stand now, how far in school do you think you will get?</td>
<td>1.32</td>
<td>1.32</td>
<td>1.32</td>
</tr>
</tbody>
</table>

*University of New Orleans Participant Educational Expectation.* When looking at the UNO participants alone, the IV average for the one item the mean is 1.40 out of two. The entire population range is 1.40.

Table 21. UNO Educational Expectation

<table>
<thead>
<tr>
<th>Educational Expectation (EE)</th>
<th>Mean</th>
<th>EE Mean Avg (0-2)</th>
<th>EE Range (0-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNO (n=77)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As things stand now, how far in school do you think you will get?</td>
<td>1.40</td>
<td>1.40</td>
<td>1.40</td>
</tr>
</tbody>
</table>

*Southeastern Louisiana University Participant Educational Expectation.* When looking at the SELU participants alone, the IV average for the one item the mean is 1.26 out of two. The entire population range is 1.26.

Table 22. SELU Educational Expectation

<table>
<thead>
<tr>
<th>Educational Expectation (EE)</th>
<th>Mean</th>
<th>EE Mean Avg (0-2)</th>
<th>EE Range (0-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELU (n=97)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As things stand now, how far in school do you think you will get?</td>
<td>1.26</td>
<td>1.26</td>
<td>1.26</td>
</tr>
</tbody>
</table>
Descriptive statistics for the Dependent Variable - Grade in College Algebra. Grades in corequisite coursework ranged from A to F for the majority of the study participants. A small group of students (3%) were on a P (Pass)/F (Fail) scale. Students who dropped the class before the designated institutions scheduled drop date received a W (Withdrawal). This constituted 11% of all study participants. For the purposes of this study, all grades of A, B, C, and P were considered passing and D, W, and F were considered failing. When looking at the entire population of participants (N=174), we see that 121 or 69.5% of participants passed College Algebra, while 53 or 30.5% failed. We see that 74.6% of male participants passed the class compared to 67.3% of females and 71.6% of white students passed that class compared to 66.7% of non-white students.

Table 23. ALL College Algebra Grade

<table>
<thead>
<tr>
<th>ALL College Algebra Grade</th>
<th>Total N=174</th>
<th>%</th>
<th>Male %</th>
<th>Female %</th>
<th>% White</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>121</td>
<td>69.54%</td>
<td>74.55%</td>
<td>67.23%</td>
<td>71.58%</td>
<td>66.67%</td>
</tr>
<tr>
<td>FAIL</td>
<td>53</td>
<td>30.46%</td>
<td>25.45%</td>
<td>32.77%</td>
<td>28.42%</td>
<td>33.33%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>174</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

University of New Orleans Grades in College Algebra. When looking at the entire UNO participants alone (N=77), we see that 65 or 84% of participants passed College Algebra, while 12 or 16% failed. We see that 85.3% of male participants passed the class compared to 83.7% of females and 93.6% of white students passed that class compared to 77.8% of non-white students. The UNO participants passed the class at a much greater rate than the entire population and UNO females outperformed males in contrast the population totals. This begs the questions: are UNO
students better prepared? Do UNO students have better support systems? Or, are UNO classes
easier than congruent classes at SELU?

Table 24. UNO College Algebra Grade

<table>
<thead>
<tr>
<th>UNO College Algebra Grade</th>
<th>UNO N=77</th>
<th>%</th>
<th>Male %</th>
<th>Female %</th>
<th>% White</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>65</td>
<td>84%</td>
<td>85.29%</td>
<td>83.72%</td>
<td>93.55%</td>
<td>77.78%</td>
</tr>
<tr>
<td>FAIL</td>
<td>12</td>
<td>16%</td>
<td>14.71%</td>
<td>16.28%</td>
<td>6.45%</td>
<td>22.22%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Southeastern Louisiana University Grades in College Algebra. When looking at the
total SELU participants alone (N=97), we see that 56 or 57.7% of participants passed College
Algebra, while 41 or 42.3% failed. We see that 57.1% of male participants passed the class
compared to 57.9% of females and 60.9% of white students passed that class compared to 51.5%
of non-white students. The SELU participants passed the class at a lower rate than the entire
population and at a substantially lower rate than the UNO participants.

Table 25. SELU College Algebra Grade

<table>
<thead>
<tr>
<th>SELU College Algebra Grade</th>
<th>SELU N=97</th>
<th>%</th>
<th>Male %</th>
<th>Female %</th>
<th>% White</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>56</td>
<td>57.73%</td>
<td>57.14%</td>
<td>57.89%</td>
<td>60.94%</td>
<td>51.52%</td>
</tr>
<tr>
<td>FAIL</td>
<td>41</td>
<td>42.27%</td>
<td>42.86%</td>
<td>42.11%</td>
<td>39.06%</td>
<td>48.48%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>97</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Logistic Regression Analysis

After analyzing the descriptive statistics, the researcher used survey data and grades in College Algebra and corequisite mathematics to run two binary logistic regression (BLR) models. The BLR reports included overall model fit, Nagelkerke R-Squared, chi-squared, beta coefficients, and p values ≤ .05. The results of the model are discussed in the following section.

**Full Model : The Probability of Passing College Algebra**

The full model as presented below explored the probability of passing college level Algebra for students enrolled in College Algebra at Southeastern Louisiana University and The University of New Orleans in the Spring 2020, Summer 2020, and Fall 2020 semesters. A binary logistic regression analysis was conducted to predict passing scores using race, sex, grade in corequisite mathematics, self-efficacy, utility value, intrinsic value, and educational expectation as predictor variables. Of the 174 participants 121 or 69.54% passed the class while 53 or 30.46% of participants failed the class.

To determine the significance of the full model the Omnibus Tests of Model Coefficients table was used. In the table, $\chi^2 = 48.238$, $p = <.001$ with df = 7. From this data, the researcher concluded that the full model is significantly different than the constant only or null model and that the model is a significant predictor of the dependent variable, pass/pail College Algebra.

<table>
<thead>
<tr>
<th>Omnibus Tests of Model Coefficients</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Step</td>
<td>48.238</td>
<td>7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Block</td>
<td>48.238</td>
<td>7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Model</td>
<td>48.238</td>
<td>7</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

To evaluate the strength of the association between the independent variables and the dependent variable the researcher examined the Model Summary. Goodness of fit was
determined by evaluating the Nagelkerke R Square. According to the model summary R squared
= .342, indicating that 34.2% of the variation in the dependent variable is attributed to the model.
The R^2 shows a moderate relationship between the independent variables and dependent
variable. Overall prediction success was 75.9%, with 88.4% for passing College Algebra and
47.2% failing College Algebra.

Table 27. Model Summary: Full Model

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>165.681a</td>
<td>0.242</td>
<td>0.342</td>
</tr>
</tbody>
</table>

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 28. Classification Table: Full Model

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADE Algebra</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>107</td>
</tr>
<tr>
<td>Overall Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. The cut value is .500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using the Wald ratio, the researcher determined that two of the seven independent
variables were statistically significant in predicting the dependent variable: Self-Efficacy (p =
< .001), and Educational Expectation (p = .009). The other independent variables: grade in
corequisite (p = .127), sex (p = .267), race (p = .88), utility value (p = .357), and intrinsic value
(p = .108) were not significant predictors in the model.

Table 29. Variables in the Equation for the Model

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I.for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper</td>
</tr>
</tbody>
</table>
Step 1a

|                  | Unstandardized Coef. | Standardized Coef. | B |     |          |          |            |            |            |
|------------------|----------------------|-------------------|---|-----|----------|----------|-----------|-----------|
| Grade Sup        | 0.416                | 0.272             | 2.335 |     | 1        | 0.127    | 0.889     | 2.585     |
| Sex(1)           | 0.49                 | 0.442             | 1.23  |     | 1        | 0.267    | 0.687     | 3.88      |
| Race(1)          | 0.064                | 0.421             | 0.023 |     | 1        | 0.88     | 0.467     | 2.433     |
| SE               | 0.36                 | 0.078             | 21.512 |     | 1        | <.001    | 1.331     | 1.668     |
| UV               | -0.083               | 0.09              | 0.85  |     | 1        | 0.357    | 0.771     | 1.098     |
| IV               | 0.195                | 0.121             | 2.59  |     | 1        | 0.108    | 0.958     | 1.542     |
| EE               | 0.823                | 0.316             | 6.779 |     | 1        | 0.009    | 2.277     | 1.226     |
| Constant         | -5.532               | 1.992             | 7.712 |     | 1        | 0.005    | 0.004     |           |

a Variable(s) entered on step 1: Grade Sup, Sex, Race, SE, UV, IV, EE.

The Exp(B) value, or the odds ratio, as stated above, indicates the predicted change in odds for a one unit increase in the predictor variable (Osborne, 2015). The Exp(B) value for Self-Efficacy (SE) was 1.433, indicating that when the SE score increases by one, the likelihood of passing the course is 1.433 times higher than an individual scoring one point lower. The Exp(B) value for Educational Expectation (EE) was 2.277 indicating that a student who plans to get an advanced degree is 2.277 times more likely to pass the class that a student who plans to only obtain an undergraduate degree.

**Model 2 : The Probability of Passing College Algebra (Corequisite Only)**

Because a majority of participants were not enrolled in the corequisite pathway a secondary analysis was run to account for errors in the first model. Of the 174 participants, only 49 were enrolled in the corequisite pathway and this may have accounted for error in using the corequisite course as a predictor (anyone not taking the course was coded as 0 in the full model and removed in model two). Because only a subset of the total population was enrolled in corequisite coursework the secondary analysis only used the corequisite grade as the independent variable and grade in College Algebra as the dependent variable and this changed the impact of corequisite coursework on the dependent variable.

To determine the significance of the full model the Omnibus Tests of Model Coefficients table was used. In the table, $\chi^2 = 35.621$, $p = <.001$ with $df = 1$. From this data, the researcher
concluded that model two is significantly different than the constant only or null model and that the model is a significant predictor of the dependent variable, pass/pail College Algebra.

Table 30. Omnibus Test: Model Two

<table>
<thead>
<tr>
<th>Omnibus Tests of Model Coefficients</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>35.621</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Block</td>
<td>35.621</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Model</td>
<td>35.621</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

To evaluate the strength of the association between the independent variable and the dependent variable the researcher examined the Model Summary. Goodness of fit was determined by evaluating the Nagelkerke R Square. According to the model summary $R^2 = .713$, indicating that 71.3% of the variation in the dependent variable is attributed to the model. The $R^2$ shows a strong relationship between the independent variable and dependent variable. Overall prediction success was 91.8%, with 82.4% for failing College Algebra and 96.9% passing College Algebra.

Table 31. Model Summary: Model Two

<table>
<thead>
<tr>
<th>Model Summary</th>
<th>Cox &amp; Snell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step -2 Log likelihood</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>27.642a</td>
</tr>
</tbody>
</table>

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 32. Classification Table: Model Two

<table>
<thead>
<tr>
<th>Classification Table</th>
<th>Predicted</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRADE College</td>
<td>Fail</td>
<td>14</td>
</tr>
<tr>
<td>Pass, 1 Fail</td>
<td>Pass</td>
<td>3</td>
</tr>
</tbody>
</table>
Using the Wald ratio, the researcher determined that the independent variable, corequisite grade, was statistically significant in predicting the dependent variable: <.001. The Exp(B) value, or the odds ratio, as stated below, indicates the predicted change in odds for a one unit increase in the predictor variable (Osborne, 2015). The Exp(B) value for corequisite grade was 144.67, indicating that when participants pass the corequisite course the likelihood of passing College Algebra is 144.67 times higher than an individual who fails the corequisite.

Table 33. Variables in the Equation for Model Two

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I.for EXP(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Step 1a</td>
<td>4.974</td>
<td>1.199</td>
<td>17.22</td>
<td>1</td>
<td>&lt;.001</td>
<td>144.667</td>
<td>13.803</td>
<td>1516.187</td>
<td></td>
</tr>
<tr>
<td>Supplemental 2 Pass, 1 Fail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-7.613</td>
<td>2.157</td>
<td>12.462</td>
<td>1</td>
<td>&lt;.001</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Variable(s) entered on step 1: Grade Supplemental 2 Pass, 1 Fail.

Conclusions

In reviewing the findings presented above, the researcher found it interesting that in the full model that grades in corequisite coursework, sex, and race were not significant predictors in the model. Educational expectation was expected to be significant in that higher expectation of degree completion led to a higher chance of passing the class. Math self-efficacy, or the individual’s beliefs on how well they will perform in math was a factor in predicting positive outcomes. Model two showed that when removing non-corequisite participants, passing the corequisite course became a significant predictor of outcomes in college level math and did a better job in predicting failure.
Based on the findings the researcher began examining the work of other scholars to determine parallels of this study to studies of a similar scope. Furthermore, the researcher began to ponder how these findings could have practical applications for practice in helping colleges and universities predict success in college level mathematics. Lastly, the researcher considered the possible limitations, delimitations, and ideas for future research.
CHAPTER 5: DISCUSSION

The purpose of this study was to understand success patterns in College Algebra with a focus on student’s self-beliefs and the effects of corequisite coursework on that success. This study attempted to better comprehend factors that contribute to success in college level algebra and to statistically model predictors of that success. Student’s race and gender were also collected to determine if these demographic attributes were statistically significant factors in final College Algebra outcomes. This study is significant in that it will serve as a tool to inform policies and procedures currently in place at institutions of higher education. These policies and procedures will impact how institutions approach retention efforts in college gateway courses, especially College Algebra.

This chapter will further explore the findings stated above and how they relate to the findings of similar studies. In addition to the discussion, implications for policy, scholarly implications, limitations, and ideas for future research are addressed. The study had three research questions stated below:

1. **Research Question One (RQ1):** Do students’ perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations predict success in College Algebra?

2. **Research Question Two (RQ2):** Does successful completion of a corequisite mathematics course accurately predict passing scores for students enrolled in College Algebra?

3. **Research Question Three (RQ3):** Are race and gender statistically significant factors in relation to outcomes in College Algebra?
Discussion of Findings

Findings from this study showed statistically significant correlations between participants’ final grades in College Algebra and their math self-efficacy beliefs, educational expectations, and corequisite grades. Additional factors including utility value, task value, gender, and race were also tested but were not statistically significant in predicting final outcomes in College Algebra. Findings of the study indicate that: 1. Math self-efficacy was a predictor variable in the full model. Participants’ perceptions of their capacity for academic achievement in mathematics was a significant predictor of success in College Algebra. 2. Gender and ethnicity were not significant factors in main model. 3. Educational expectations, as expected, was significant in predicting college level math in the main model. In order to account for the lower number of participants enrolled in the corequisite pathway, the researcher created a second model. Model two only included the 49 participants enrolled in the corequisite pathway as well as the College Algebra course. For this model, grade in corequisite math was the only independent variable and outcome in College Algebra was the dependent variable. Model two focused only on research question two: Does successful completion of a corequisite mathematics course accurately predict passing scores in College Algebra? Unlike the full model, grades in corequisite math were significant in predicting success in College Algebra.

Predicting Success Using Math Self-Efficacy

Self-Efficacy has been proven to be one of the most important motivational variables in improving students’ academic performance and overall well-being (Bandura, 1977, 1997). Bandura (1997) goes on to say that self-efficacy is not only important in improving performance, but it is “a key factor in a generative system of human competence” (p. 37). Self-efficacy plays a role in how individuals feel about themselves and whether they believe they can achieve certain
goals. In this study, math self-efficacy was measured to see the predictive ability of self-belief, particularly in mathematics, on final outcomes in College Algebra for college students participating in this study.

Math Self-efficacy was a predictor variable in the full model. Participants’ perceptions of their capacity for academic achievement in mathematics was a significant predictor of success in College Algebra. Older studies (Eccles, et al., 1983; Trusty 2000) have found that self-efficacy was an accurate predictor of student’s educational expectations, but fewer studies have focused on self-efficacy beliefs and those beliefs ability to be predictors of outcomes on college level mathematics. The findings of this study are in keeping with previous studies (Byrnes, 2003; Crombie et. al.,2005) showing that math self-efficacy can predict final outcomes in college coursework. This finding is important because it shows that institutions of higher education can survey, identify, and provide interventions to students who are likely to struggle in college mathematics. Knowing if a student has a low self-belief in math can serve as an early alert for universities and help them to avoid student attrition and failure. This benefits the institution but also has a significant positive impact on the student.

Non-Predicting Factors: Race, Gender, and Corequisite Coursework

The present study attempted to not only look at student achievement in college level mathematics using students’ self-beliefs about math and educational expectation, but also use demographic attributes and grades in corequisite coursework to predict final math outcomes. The following section will focus on the independent variables used in the study that were insignificant factors in predicting final math outcomes in the main model. Race, gender, and corequisite coursework are broken down and compared to findings in previous studies.
In the present study, research question two asked: Are race and gender statistically significant factors in relation to outcomes in College Algebra? The Alternate hypothesis stated that race and gender have a significant impact on success rates for students in College Algebra. Previous studies (Eccles, et al., 1983; Byrnes, 2003; Koller, Baumert, & Schnabel, 2001) have found that student race/ethnicity have had a positive correlation to educational expectation and outcomes in college level math. However, the present study did not find such correlation. Student race/ethnicity was not a significant predictor of final math outcomes. The present study used the categories; white and non-white and found that there was no statistical significance in final math outcomes between the groups. Although race and ethnicity are still important factors to consider when studying achievement, this study shows that race is not a mitigating factor in College Algebra outcomes.

This study also differed from previous studies (Eccles, et al., 1983; Byrnes, 2003; Koller, Baumert, & Schnabel, 2001) in that it found that gender was non-significant in the prediction of final math outcomes. In reference to research question two, as stated above, the null hypothesis was proven correct and gender was not a significant factor in this study. This finding correlates to the findings of Dalton, Ingels, Downing, & Bozick (2007) and shows that the math gender gap may be closing and that male students and female students have similar outcomes in college level math.

A surprising finding in the present study was that success in corequisite coursework was insignificant in predicting grades in college level mathematics. Previous studies (Collins, 2013; Boylan, Calderwood, & Bonham, 2017) shows a strong positive correlation between grades in corequisite coursework and final outcomes in college level mathematics. Research question two asked: Does successful completion of a corequisite mathematics course accurately predict
passing scores in College Algebra? Once again, the null hypothesis (Success in College Algebra is not impacted significantly by successful completion of a corequisite math course) was proven correct. Without taking study limitations into account, this finding showed that passing corequisite coursework at the two participating institutions was ineffective in predicting algebra outcomes. Normally this finding would warrant a deeper look into the corequisite coursework to determine why it was insignificant in the study. However, this finding is likely due to the fact that of all the participants (174) only 49 participants were enrolled in the supplemental corequisite course. In order to retest the significance of the corequisite grades in relation to math outcomes, a second model was developed and only looked at the 49 students enrolled in corequisite coursework using only the grade in the corequisite coursework as the independent variable and final grade in College Algebra as the dependent variable. Findings from this model are discussed further in the section titled Predicting Success using Corequisite Coursework

Predicting Success Using Educational Expectation

Research question one asked: Do students’ perceptions of math self-efficacy, utility value, intrinsic value, and educational expectations predict success in college-level coursework? This section will focus on educational expectations and their ability to predict final math outcomes. Educational expectations are tied to success in educational settings. While unrealistic expectations can, in some cases, lead to disappointment, realistic expectations have been linked to better educational outcomes including achievement of educational goals and attainment of a college degree (Pinquart & Ebeling, 2020).

Previous studies (Morgan, 1998; Andres, Adamuti-Trache, Yoon Pidgeon & Thomsen, 2007; Anders et al., 2007) have used educational expectancies in relation to college completion. This study attempted to use participants’ educational expectations as a factor to predict outcomes
in college level mathematics. In this case, the alternate hypothesis was proven correct and showed that participants’ expectancies about college predicted the dependent variable, outcomes in College Algebra. This finding may seem obvious: participants who believe they will be successful in college do better in math classes, but what does it actually mean? If we delve deeper into this finding we see that educational expectation is tied to higher self-efficacy (Eccles et al. 1983). Participants who are confident in their abilities, in general, have more success in college. This knowledge can also be used to identify and provide services to assist students in successful course completion and eventual graduation. If colleges survey students to determine educational expectancy they can better serve students who do not believe they can be successful in college and provide services that will increase course completion and graduation rates.

**Predicting Success Using Corequisite Coursework**

In order to account for the lower number of participants enrolled in the corequisite pathway, the researcher created a second model. Model two only included the 49 participants enrolled in the corequisite pathway as well as the College Algebra course. For this model, grade in corequisite math was the only independent variable and outcome in College Algebra was the dependent variable. Model two focused only on research question two: Does successful completion of a corequisite mathematics course accurately predict passing scores in College Algebra?

Model two did not account for motivational factors, participant self-belief, or other demographic variables. Rather, it focused only on the effectiveness of corequisite grades to predict outcomes in College Algebra. Because most institutions of higher education have abandoned the old multi-sequence remedial model and transitioned to the corequisite model the researcher chose to create a model using only one independent variable (grade in corequisite) to
predict outcomes in College Algebra. In this case, the results proved the alternate hypothesis: Success in corequisite coursework has a significant impact on performance in College Algebra. This finding was in line with previous studies (Cullinane, 2015; Vandal, 2016). As expected, participants who are successful in corequisite coursework have a greater likelihood of passing College Algebra. We already know that the corequisite model outperforms the old remedial model, but this gives us further evidence that the corequisite model can bolster student performance and increase success in college level math. With increasing numbers of students admitted to college needing additional support in math, this finding shows that colleges and universities might focus more time and money on the corequisite model to ensure that students have every opportunity to not only pass math, but to understand the concepts that will help them in their future studies.

**Scholarly Implications**

The use of the expectancy–value theory of achievement motivation was suitable for this study. Expectancy-Value Theory (Eccles et al., 1983; Eccles, 2009) provides a framework for achievement motivation that helps to explain students’ effort, choices, and achievement in relation to academic and non-academic domains; theorists maintain that individuals’ persistence and performance on a task can be predicted by their belief of how they will perform on the task and how much they value the task. The three main components of the theory include self-efficacy, utility-value, and intrinsic value. For this study, these components were collected and used in an attempt to predict outcomes in college level algebra. In addition to these components, educational expectation, corequisite math grades, gender and race were used as independent variables. Studies have used aspects of EVT to predict outcomes in College Algebra, but the use
of EVT along with corequisite grades is less present in literature because of the recent transition from remedial to corequisite models.

This study showed a correlation between math self-efficacy, educational expectation, and corequisite coursework on College Algebra outcomes. However, race, gender, utility value, and intrinsic value were non-predictors. In looking gender specifically, this study supports other studies in that gender is not a factor in predicting achievement outcomes. (Dalton, Ingels, Downing, & Bozick, 2007). Achievement outcomes have long been tied to gender especially in mathematics, where females have less success in college level math. This study adds to the body of literature that supports the removal of this deficit lens and instead focus on other variables such as first-generation status, college major, socioeconomic status, high school GPA, and parents’ educational level.

**Implications for Policy**

Looking past the theoretical implications, this study had several findings that have practical implications for higher education policy and strategies to identify and retain college students who may struggle in college level math. The findings of this study have implications in three areas: implications for admissions; implications for advising; and implications for retention. This study found that math self-efficacy, corequisite success, and educational expectation beliefs are predictors of success in college level mathematics. These findings have implications that policymakers can use to address student success and retention in their first-year of college, a time traditionally associated with high attrition and drop-out (Complete College America, 2012). The finding showing math self-efficacy and educational expectation are predictors of success in College Algebra is not novel (Byrnes, 2003; Crombie et. al.,2005). This study, however, calculated the odds of successful completion of College Algebra using scores in
corequisite mathematics for students enrolled in the corequisite pathway. This finding, along with the others can, lead to practical applications of policy and practice that will lead to student success, retention, and eventual graduation.

By measuring new college student math self-efficacy and educational expectation at admission, universities can identify and track students who have a high level of risk of failing college level math. This study, along with others (Ayree, 2017), shows that higher levels of math self-efficacy and educational expectation are associated with success in college level math and leads to a greater likelihood of college completion. Measuring student math self-efficacy and educational expectation at admission will allow universities to identify students and develop programming that can focus on increasing math self-efficacy leading to greater math outcomes and university completion.

A study conducted by Samuel and Warner (2019) showed, in a pre-test post-test experiment, that interventions designed to address math anxiety in college students led to a reduction in math anxiety, but also an increase in math self-efficacy. The interventions took place in the math classroom and were conducted by math instructors. They included a one minute deep breathing exercise, positive math affirmations said aloud, and were followed by a plan for the day. The professor prompted students to take deep breaths whenever feeling anxious and affirmed that mistakes are a part of the learning process. These simple interventions can take place in the classroom, in advising sessions, or in anxiety seminars, open to all college students, run by the university. This type of thoughtful intervention shows students that the university is not just a place of learning, but also a place to learn strategies to cope with anxiety and boost self-confidence.
In this new era of higher education, gateway courses have a new meaning. In the past, gateway or barrier courses in math were used to identify students who were not prepared to succeed in college level coursework (Koch & Drake, 2018). With dwindling enrollment and skyrocketing tuition, universities have shifted from weeding out students to a model that is geared towards supporting students and assisting in any way possible to see that students succeed. Universities have implemented corequisite models and early alert systems designed to identify students who are struggling in gateway courses and intervene before failing coursework. These systems are a first step in supporting students and increasing retention.

Early alert systems generally rely early detection indicators to identify students who are in danger of failing coursework (Lauria, 2021, Yao et al., 2019). In addition to these indicators, universities can survey students to measure their math self-efficacy and educational expectation. These factors will serve as yet another tool to ensure that students are successful and persist in coursework. Indicators will be available before the student sets foot in the classroom and will provide a path to intervention before there is a problem. The following sections will focus on specific interventions and strategies policy makers can implement to improve outcomes in College Algebra.

**Math Self Efficacy Workshops for Students**

One practical way that colleges and universities can improve success rates in college level math and increase student’s overall math confidence is to offer math self-efficacy workshops for incoming freshman. Bridge programs focusing on math self-efficacy and mathematics anxiety have been shown to greatly reduce math anxiety in students entering STEM programs (Liu, 2018). These findings can be used to develop workshops for the larger population of students entering colleges and universities. Math Self-efficacy workshops can be added to the
new student orientation schedule and be mandatory for all participants. The five questions used in this study can be the focus of student discussions and provide a qualitative component that universities can use to boost student math self-efficacy and improve math outcomes (Wang, 2011; Crombie et al., 2005; Stevens et al., 2007). This study measured participant math self-efficacy but did not get to the root of why some participants had lower math self-efficacy beliefs. This workshop can be led by admissions in conjunction with math faculty and consist of an open dialogue that will give participants an opportunity to voice fears and reasons they do not feel confident in math related activities. Some of these reasons will certainly be poor preparation (Long, 2014; Long et al. 2009) which cannot be corrected without remediation, but workshop leaders can lessen fears and concerns by letting students know about university programs in place that can assist students as they enter the university and enroll in math coursework (i.e. math centers, peer tutoring, faculty office hours).

**Educational Expectancy Workshops**

Similar to self-efficacy workshops for math, educational expectation workshops can be offered that will focus in one important question: Do you believe you will complete your college degree? In this study, a surprising ten percent of participants did not believe they would complete a college degree. This finding is similar to findings in previous studies (Wang, 2011, Anders et al., 2007). This is a significant number considering that every participant met entrance requirements to be admitted to the universities and were enrolled in coursework. In fact, any college student who does not believe they will graduate is significant to the university because a majority of these students will never obtain a degree (Anders et al., 2007). In an open forum, students may not admit their fears of failure, but they will have an opportunity to discuss common fears about college that many of the students will likely share. This workshop can be
run by admissions staff in conjunction with upper level college students and recent graduates who will be able to offer advice and strategies they used to quell fears and become successful students.

Students should also be surveyed to answer the expectancy question, as presented in this study, before and at completion of the workshop. The exit responses can prompt university officials to students who do not expect that they will graduate from college even after thorough discussion and strategies provided by workshop leaders. This type of response should be dealt with on an individual basis. Admissions representatives or advisors should contact and track these students for their first 30 hours taken at the university.

**Supports for Corequisite Math Students**

Although supports are available for corequisite students, additional requirements should be mandatory. This study along with others (Campbell, 2015; Cullinane, 2012; Complete College America, 2016) show that corequisite coursework is linked to higher success rates in College Algebra. This study went further to show that success in corequisite coursework predicts success in College Algebra. This finding makes it clear that guiding students to success in corequisite math is vital not only for better math outcomes but student retention and eventual graduation. Peer mentoring (Kuchynka et al., 2021) and math labs (Ware, 2000) can serve as tools to strengthen math self-efficacy in students and support better outcomes in College Algebra.

Corequisite math students should be required to spend three hours a week in the university math lab to complete homework assignments and review math study guides. A study by Ware (2000) found that 95 percent of participants believed their math lab was conductive to learning and 90 percent of participants believed that lab participation positively impacted their
final grade in their math course. Math lab hours should be built into the syllabus and count for a substantial part of the final grade. Student should be rewarded for additional hours spent in the lab each week in the form of extra points on homework assignments, or on tests. Math lab requirements will help to build good study habits and also instill a sense of community for new college students.

Students enrolled in corequisite mathematic courses should be matched with and mentored by college students who successfully passed corequisite coursework and College Algebra. A study by Kuchynka et al., (2021) paired Black and Latinx students pursuing STEM degrees with mentors who provided guidance on challenges, tips for success, management of schedule, and goals; the mentorship improved mentee self-efficacy, and boosted their confidence in ability and goal completion during the stressful transition period. Pairing corequisite students with students who successfully passed corequisite coursework and College Algebra should have similar effects and increase student completion in math coursework.

**Instructor Self-Efficacy Strategies for Students**

As discussed above, math instructors can positively effect student math outcomes by implementing interventions in class to relieve math anxiety and increase student self-efficacy (Samuel and Warner 2019). Math anxiety has been shown to have a negative impact on math self-efficacy (Akin & Kurbanoglu, 2011). Peters (2013) found that classroom climate had a significant positive effect on student math self-efficacy levels. Systemic implementation of professional development for faculty has been shown to support faculty members devoted to the preservation of rigor while attending to the critical mathematical needs of students enrolled in math classes (Jaggars et al., 2015). Math department heads should train math faculty, specifically those teaching College Algebra and corequisite math, to implement strategies including breathing
exercises and positive math affirmations at the beginning of each class (Warner 2021). A simple pre-test post-test given at the beginning (prior to intervention) and the end of class can determine in real time if the student anxiety level is reduced due to the interventions and positive reinforcement given throughout the class. Students can complete a poll indicating their overall math stress level on a 10-point likert scale where one is not stressed at all and 10 is extremely stressed. Students on the higher end should be advised to visit counseling services to discuss strategies to reduce stress.

A study by Samuel and Warner (2019) used pre-to post-data to access math anxiety and self-efficacy after “embedding a combined mindfulness and growth mindset intervention in a mathematics classroom” (p. 13); the study found that student who received the intervention reported increased math self-efficacy scores and lower math anxiety by the end of the semester. This policy will show new college students that the university and faculty not only care about their academic achievement, but also their personal growth and mental health. Classroom climate, including faculty accessibility, meaningful feedback, and self-efficacy building strategies should inform designs for programs wanting to boost student confidence in coursework and increase retention and completion rates for students enrolled in corequisite and College Algebra classes (Campbell, 2015).

**Implications for Future Research**

Data collected for this quantitative study showed the predictive ability of self-efficacy beliefs, educational expectation, and corequisite grades on final outcomes in College Algebra. Future research is needed to understand why some new college students feel less prepared for math and feel that they will not be successful in graduating college. Studies have pointed to low standardized test scores and poor preparation in high school but a qualitative study examining
high school experiences and parental involvement may provide additional insight. Additionally, a mixed-methods study would allow for advanced understanding and explanation of the quantitative analysis.

In addition to qualitative analysis additional qualitative analysis should be employed focusing on demographic factors that will provide insight for students entering college today. Variables such as first-generation status, college major, socioeconomic status, high school GPA, and parents’ educational level can provide much needed insight for colleges and universities in the attempt to improve student outcomes. Finally, this analysis was done specifically for College Algebra. This study can be expanded to include any course where student attrition is an issue, specifically in the areas of English composition and science.

Another possible implication involves the passing rate for College Algebra at both institutions participating in the study. Overall, all participants (UNO and SELU) passed college algebra at a rate of 70%. When we look closer at the pass rates at each individual university we see that UNO students passed at a rate of 84% while SELU students passed at a rate of 58%. Only assumptions can be made at this point, but they may include that SELU students were less prepared for College Algebra than were students at UNO, and the possibility that UNO has better supports in place for College Algebra students. Upon closer examination we also see that a larger number of students enrolled in College Algebra at UNO were also enrolled in the corequisite course, 40% compared to 19% at SELU. This could also be a factor in the higher passing rate for UNO students. Without knowing the cause, further research is warranted to determine the reason for the significant success rates of students in the two institutions.
Limitations

Limitations for this study include the limited sample size due to only surveying students at two institutions, a small number of corequisite students, and limited demographic factors.

Data Set Limitations

The study participants are all students enrolled in College Algebra at two institutions in Louisiana. Originally, the survey was to be sent to three institutions, but only two responded to the request to their Institutional Review Board. Studying students at two institutions led to a limited sample size for the study. Generalization was also affected by the choice to study students in only two settings. In addition to the number of institutions, the COVID-19 pandemic played a role in the limited sample size. The initial plan was to survey participants through email and visit classes to generate additional responses. The COVID-19 pandemic made it impossible to visit classrooms because during the time of collection courses were being held online at both institutions. The pandemic increased the collection period from one semester to one full calendar year the get the necessary amount of responses. Although the results may not be generalizable to a larger population, the study will provide insight to the universities studied on the effectiveness of the corequisite program and how motivation of students drives success.

Corequisite Participants

The major focus of the study was to determine the predictive ability of success or failure of students enrolled in corequisite coursework. The corequisite programs were new at the institutions and resulted in a limited sample size for corequisite students in the study. The participants of the study were all enrolled in College Algebra. Some participants were also enrolled in a corequisite course because they lack the math knowledge or test scores to enter College Algebra. Initially, the study was to only include participants in corequisite coursework.
AND College Algebra but the limited population size made it difficult to gather the needed number of participants. Because of this, the AND stipulation was removed and the population consisted of College algebra Students with some participants enrolled in the corequisite class. Further studies will be required to assess the effectiveness of motivational factors and corequisite coursework on math success with a larger population of corequisite students.

**Demographic Factors**

The present study was conducted with a small number of motivational and demographic factors. Grade in corequisite course, self-efficacy, utility value, intrinsic value, educational expectation, gender, and race will serve as independent variables, but other important variables could also have been included such as, college major, socioeconomic status, high school GPA, and parents’ educational level. Although other variables are available, the researcher believed the selected variables will have the greatest impact on student motivation and success in math coursework.

**In Closing**

College Algebra represents a pivotal point in the journey of every college student. Although universities have taken steps to ensure that it does not become a barrier to college completion, many students never complete the class and go on to an eventual degree. This study sought to understand what factors lead to successful completion of College Algebra. Knowing what factors lead to success allows policy makers to implement strategies and interventions to improve student outcomes. This study established a structure to guide future research and policy by using Eccles, Wigfield, and colleagues’ (1983) expectancy–value model of achievement motivation. It also showed that corequisite success as a variable to predict math outcomes. Understanding the reasons why students struggle with College Algebra is a complex undertaking.
The researcher hopes that this study can prompt future research and inform policy that will lead to the success of college students in early math coursework and transform College Algebra from a barrier to a window for success.
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APPENDIX A

Independent Variables and Related Survey Questions

Questions from the National Educational Longitudinal Study: 2002 (ELS: 2002)

**Independent Variables**

*Self-efficacy in math*

1. bys89a-I'm confident that I can do an excellent job on my math tests.
2. bys89b-I'm certain I can understand the most difficult material presented in math texts.
3. bys89l-I'm confident I can understand the most complex material presented by my math teacher.
4. bys89r-I'm confident I can do an excellent job on my math assignments.
5. bys89u-I'm certain I can master the skills being taught in my math class.

*Utility value*

1. bys89d-I study to get a good job.
2. bys89h-I study to increase my job opportunities.
3. bys89p-I study to ensure that my future will be financially secure.

*Intrinsic value in math*

1. bys87a-When I do math, I sometimes get totally absorbed.
2. bys87c- Because doing math is fun, I wouldn't want to give it up.
3. bys87f- Math is important to me personally.

*Educational Expectation*

1. As things stand now, how far in school do you think you will get?
VITA

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