AN EXPLORATORY INVESTIGATION OF THE BELIEFS, BEHAVIORS, AND PERFORMANCE OF WOMEN IN COLLEGE ALGEBRA IN A RURAL COMMUNITY COLLEGE

A Dissertation

by

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BS, Southwest Texas State University, 1971
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Submitted in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

in

CURRICULUM AND INSTRUCTION

Texas A&M University-Corpus Christi
Corpus Christi, Texas

August 2016

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This dissertation meets the standards for scope and quality of Texas A&M University-Corpus Christi and is hereby approved.

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ABSTRACT

Women are the majority of students in colleges and universities at the present time, but the increase in number of women in the Science, Technology, Engineering, and Mathematics (STEM) fields is not keeping up with the projected need of the 21st century (Halpern et al., 2007). The purpose of this study was to recognize and describe the math beliefs, math behaviors, and performance of women in college algebra in a rural community college. The theoretical foundations of this study were the socio-cognitive theory of Bandura (1982), the socio-cultural theory of Vygotsky (1930-34, 1978), and the attribution theory of Weiner (1979) merged with the research of Hendy, Schorschinsky and Wade (2014).

This quantitative study used a correlational design to determine if a significant correlation existed between the math beliefs, math behaviors, and performance in college algebra. One hundred seven women enrolled in college algebra in a rural community college during fall semester of 2015 participated in the study. A survey of 40 short answer and Likert scale questions was used to study the math beliefs of the women, and semester grades, attendance, homework average, and hours used in tutoring were collected from college records.

No significant correlations were found between math beliefs and performance in college algebra. There was a significant correlation between the math behavior, homework, and performance. Significant correlations were found among math beliefs, between math beliefs and math behaviors, and between math beliefs and demographics profiling women who are successful in college algebra.

Identifying the beliefs and behaviors of women in college algebra and expanding on the findings in colleges and universities may provide support for successful degree completion in the STEM fields. Identifying the needs of women can serve as a pathway to college success.

DEDICATION

I dedicate this dissertation to my family. To my son, William Travis, my daughters, Rebecca and Katherine, for all the joy, love, and support they have given through the years. To my sons-in-laws, Daniel and Brad, for sharing their lives with my family. To my most wonderful grandchildren, Joseph, Brooklynne, Lillian, Abrams, and Joanna, for all the warmth, affection, excitement, and pleasure they bring to my life.

I also want to dedicate this dissertation to my brother, Ray, for his unwavering support and encouragement. To my sisters, Melanie, Laura, Wendy, and Paula, for their love, friendship, and memories we have always shared.

ACKNOWLEDGMENTS

I want to express gratitude to the members of my dissertation committee, Dr. Dan Pearce, Dr. Faye Bruun, Dr. Guang Zeng, Dr. Tonya Jeffery, and Dr. Joseph Mollick for sharing their expertise and guidance in this study. To Dr. Faye Bruun, a thank-you is not good enough, not a strong enough word to tell how much I appreciate your unlimited kindness, support, and help through this program. I could not have survived this last year without your help and words of kindness. Last, but not least, thank you Dr. Linda Végh for your love of writing and all the hours you devoted to editing this study. You turned an insurmountable task into one of joy and friendship.

I want to acknowledge the support of my colleagues in the Mathematics Department: Mary Kay Best, Cheon Sig Lee, Susan Parks, and Curt Villarreal, who supported my efforts in collecting the data. Thanks to Dr. Paula Kenney-Wallace, Irma Cantu, and Noemi Aguilar for letting me bounce ideas off you and encouraging me to keep focused. I also want to thank Katharine Mason for the training and patience you so kindly gave me in setting up my survey through the Qualtrics® program and Dr. Wesley Wilson for your love and knowledge of statistics and Excel®. To Dr. Nicolas Curiel, thank you for all your hours of tutoring and advice through the data analysis. To my students, I want to express my appreciation for all the questions and challenges that you have presented to me that has made me the teacher I am today.

I send a special message of gratitude to Dr. Hendy, Dr. Schorschinsky, and Dr. Wade for sharing their talents and allowing me to use their survey, *Three Measures of Math Beliefs in College Students*. Without this knowledge and assistance, this study would have been much more difficult to accomplish.

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Chapter I

Introduction

To remain competitive in the global market, colleges, universities, and businesses across the United States are investing millions of dollars into support people: advisors, counselors, mentors, tutors and instructors, and support systems with the intent of producing successful science, technology, mathematics, and engineering (STEM) majors (National Center for Education Statistics, 2013). Identifying the people, methods, and materials that promote the largest gains in graduation and retention should be forefront in educational research.

Success of women in the STEM fields is a special area being considered in present day public education. In the 21st century, talented women in the fields of mathematics and science are being sought. Improved success in mathematics continues to be of national concern. Women are in the majority of students enrolled in college with a 60% leading graduation rate (Horn & Carroll, 2006). Efforts are being made in Texas to achieve Goal 2025, proposed by the Lumina Foundation boosting college attainment, and proposing that 60% of Americans obtain a postsecondary degree or credential by 2025 (Erisman & Steele, 2015). As of the 2011 census in Texas, 34.5% of the 13.4 million working age adults 25-64 years of age hold a two- or four-year college degree. The rates for non-traditional women who are attending college and earning associate and bachelor degrees are 18.95% for ages 25 to 34 years and 16.5% for 35 to 54 years, as recorded in the United States Census Bureau report (2014). Lack of improved success of women in college mathematics is in the forefront of this national dilemma (Andreescu, Gallian, Kane & Mertz, 2008). The researcher has come to the conclusion and suggests that this may be of a priority concern not only for college and universities but also for counselors, instructors, curriculum experts, and textbook and software companies is how to improve the success rates of women in mathematics.

At a time when jobs that require little education are disappearing, many women are enrolling in college to find better jobs, improve the quality of living of their families and expand their own knowledge base and qualifications. These women will be an important portion of the increase in jobs as predicted by the Center on Education and the Workforce. Texas will have an increase of 7.7 million jobs (56%) that will require postsecondary education by the year 2018 (Carnevale, Smith, & Strohl, 2010). In addition, Recovery 2020 report on the American economy predicts that 30% of jobs will require an associate degree and 35% of jobs will require a bachelor degree (Carnevale, Smith, & Strohl, 2013). Of these nearly 60% of high-demand jobs in Texas will require postsecondary credentials (Texas Workforce Investment Council, 2008).

A major impediment to the completion of college degrees, particularly in the STEM fields is the gate-keeper course, college algebra. Women have traditionally been underrepresented when identified in areas of profound mathematical ability, due in part to socio-cultural, educational, and environmental factors (Andreescu et al., 2008). Without the nurturing of mathematical abilities of women, there will be fewer completions of college degrees in the STEM fields.

This study will explore the beliefs and behaviors that affect success in women enrolled in college algebra classes in a rural South Texas community college. The power of beliefs strongly affects what people want and whether they succeed in attaining their goals (Dweck, 2006). This study expects that students' beliefs will be expressed through the surveys and students' success in college algebra will be measured by end-of-course scores. Recognizing motivational factors and experiences that ensure success in women in the mathematics classroom is powerful data that college educators can utilize in developing methodologies, mathematics objectives, and support services, such as supplemental instruction tutoring, mentoring, advising, and counseling. Three theories form the foundations for this study: socio-cognitive theory of Bandura, socio-cultural theory of Vygotsky, and attribution theory of Weiner. Bandura (1991) stated that people form behavior standards that guide, motivate, and regulate their actions through the interplay of intrinsic and extrinsic sources of influence. In socio-cognitive theory, human behavior operates through self-monitoring of one's behavior, its determinants, and its effects mediating external influences and providing purposeful action.

Socio-cognitive Theory

One of the more central and pervasive mechanisms that control functioning and affects peoples' responses to events within their lives is self-efficacy, their belief in their capability to control the factors. By surveying women successful in college algebra, more help can be provided to women. Other people involved in the success mechanism supporting women also can be made aware of significant beliefs and behaviors.

According to Bandura (1991) judgment of self-capabilities through *self-percepts* of efficacy sets up a relationship between a person's knowledge base and the actions that one takes in using this knowledge. The execution of one's knowledge within the environment requires cognitive, social, and behavioral skills integration into a course of action. The amount of effort one puts into a task is determined by how a person judges his/her own self-efficacy in that task thus resulting in variations of performance from low to optimal success. By examining the self-efficacy scores of women who are successful in college algebra, more interventions can be made available to control and increase self-efficacy in students and, thereby, energy can be spent by colleges and universities in supporting this success.

Self-efficacy is a strong predictor of academic performance when task and domain-specific studies are used (Bandura, 1982). Self-efficacy mediates the influence of outside determinants such as more global self-beliefs, anxiety, usefulness, and attributions, along with academic background, gender, ethnicity, and socio-economic status. Students are affected by beliefs of parents, peers, and teachers and the effort put forth in learning is influenced by these outside determinants. Self-efficacy affects human behavior by influencing choice of behavior, amount of effort, thought patterns and emotional reactions (Pajares,1995). Behaviors relating to study habits, attending class, doing homework, and attending tutoring can be results of students' beliefs. Outcomes are related to self-efficacy. Students confident in their mathematics skills expect high grades and expect their work will reap such benefits as course completion, graduation, and job placement. The value students place on mathematics factors into their successful completion of courses and students see it as important in reaching goals. Feather (1988) states that perceived ability and importance are correlated and show a strong effect on the choice of majors.

Socio-cultural Theory

Socio-cultural theory of human learning states that learning is a social process and human intelligence originates in the culture in which one develops (Vygotsky, 1930-1934, 1978). Vygotsky's *zone of proximal development* supports the learning environment providing tools for discussion, writing, problem-solving and in turn providing support systems to scaffold understanding and cognitive growth (Briner, 1999). Gottlieb (1995) points out that genes and environment cooperate as we develop thus by exploring the surveys from these successful women; this study will help facilitate the profiling and labeling of noncognitive factors.

There exists some research on noncognitive factors affecting success in college mathematics courses. Rives (1992), one of the first researchers to examine the success in college algebra, found that preparation and length of time since last mathematics course were affective factors needed to succeed in mathematics courses. Family structure was identified by Curiel (2010) to have significant relationships with college algebra. Retention and success in college as indicated by non-academic factors of academic goals, institutional commitment, and social support were found to be of significant value (Lotkowski, Robbins, & Noeth, 2004). These factors are important to this study, but more research is needed to explore the experiences and motivators that are affecting women, especially those in community colleges in South Texas. The intent of this study is to examine the motivators and noncognitive factors of women who are successful in college algebra and compile a profile that women, educators, and support personnel, advisors, mentors, tutors, supplemental instructors may use to aid in the scaffolding programs that support successful completion by women in their college algebra courses and lead them to successful completion of their degrees.

Attribution Theory

Lastly, successful performance comes from internal, stable, controllable factors (Suarez & Sandiford, 2008). Attribution theory deals with how the social perceiver uses information to arrive at causal explanations for events (Fiske & Taylor, 1991). A student realizing that his/her beliefs are an influencing factor on success and goal attainment can learn to control and strengthen these beliefs. These beliefs in turn can affect the behaviors that aid in learning and degree attainment. Weiner (1979, 1986) suggests that the effort that students put into their academic work can be explained by the beliefs to which students attribute their success and failure. Upon realizing the value of mathematics and how certain recommended behaviors can produce successful completion of mathematics courses, students' confidence and belief systems are strengthened. Attribution theory poses a relationship between the way students explain the causes for their successes and their performance (House, 2003; Kivilu & Rogers, 1998; McMillan & Forsyth, 1981). Identification of the beliefs and behaviors, which women who are successful in college algebra attribute to their success, can save time and money and result in more productive ways to benefit the student.

Expectancy Value Theory and Health Belief Model

Two theories used by Hendy, Schorschinsky, and Wade (2014), the expectancy-value theory of Wigfield and Eccles (1992) and the health belief model of Janz and Becker (1984), will be of additional importance to this study. These two theories are the basis for this study's measurement tool: *Three Measures of Math Beliefs in College Students* (Hendy, 2015). The expectancy-value theory states the recommended behaviors and the mathematical understanding that are part of mathematic studies are valuable tools used for immediate and long-term goals (Wigfield & Eccles, 1992). Students who believe that mathematics is an important requirement to a degree and a job value mathematics and see it as a resource.

Bandura (1991) stated that the self-efficacy of a student has a deep connection between the knowledge base acquired and the performance in using that knowledge. The beliefs that students adopt from their socio-cultural environment, parents, teachers, and peers have great impact on their behaviors in problem solving and mathematics (Vygotsky, 1978; Briner, 1999). The value system that a student uses to engage in mathematics courses and degrees requiring mathematics is learned from society and plays an important role in the choosing of college majors, especially those in the STEM fields (Weiner, 1979, 1986). The attitudes that society portrays of women and the STEM fields and the ability and capability of women in these fields are influential factors (House, 2003). The student's belief in self, society's belief in the student, and the attitude toward the value of mathematics form a conglomerate of factors that build and support a student's beliefs in ability, thus affecting performance and determination to succeed (Hendy et al., 2014).

The health belief model of Janz and Becker (1984) was developed to explain why some individuals failed to adhere to recommended health programs. Despite seeing their value and having confidence in these recommended behaviors, patients failed to follow the plans because of perceived barriers. Hendy et al. (2014) used this model to explain why students fail to perform recommended math behaviors. Students who are confident that mathematics is important agree that attending class, doing homework, and going to tutorials are behaviors that are essential to successful course completion, yet still allow barriers of time management, work and family responsibilities, and personal perseverance to hinder success. Figure 1.1 shows the relationships among the theories and the interactions between belief, behaviors and barriers, which are the focus of the present study.

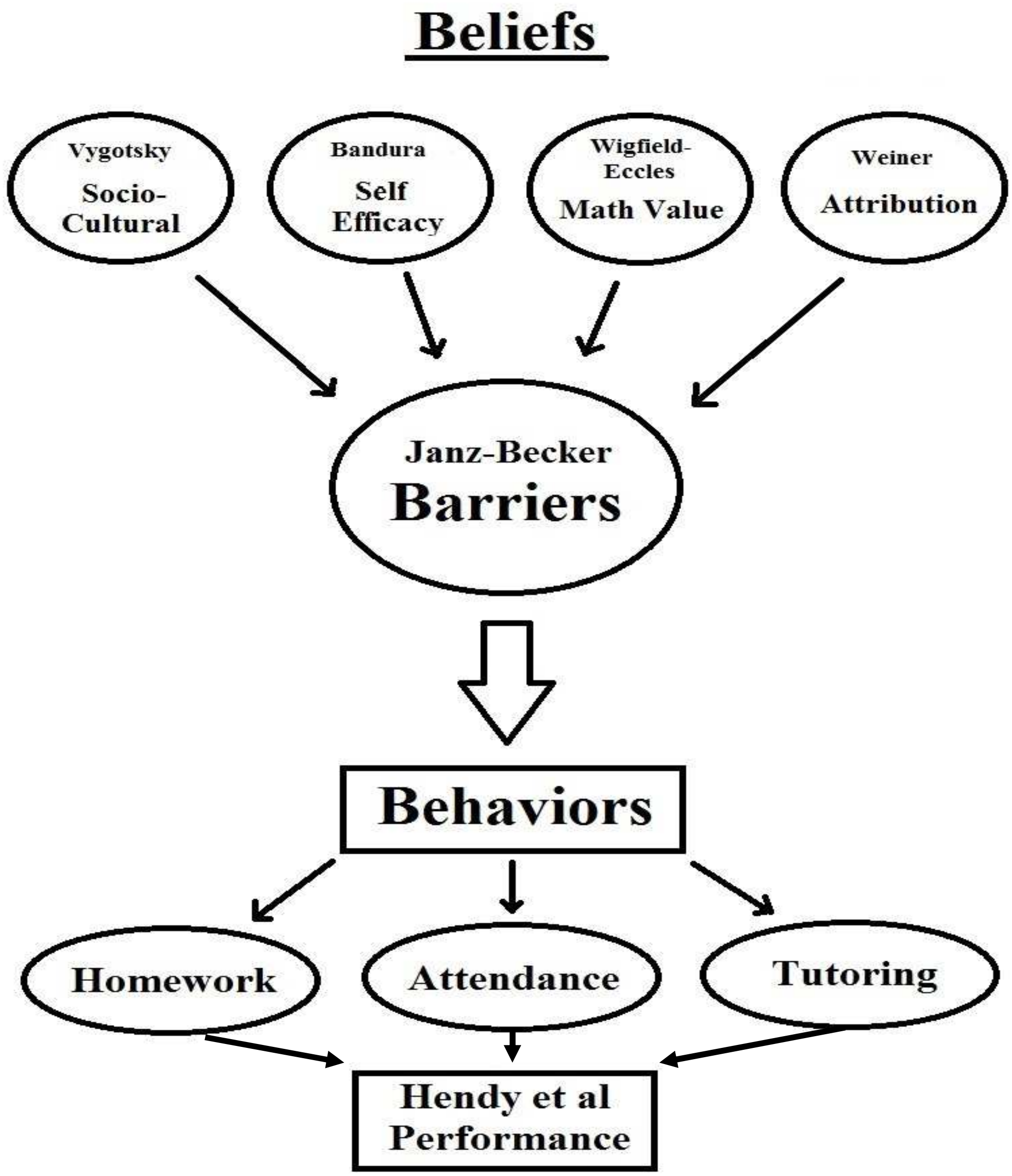

Figure 1.1

Beliefs, Behaviors, and Barriers Interaction

As these beliefs mature and become an important factor in determining behavior systems, there can also exist intervening barriers (Janz & Becker, 1984) that interfere with the pathway from belief to performance. By looking more closely at the beliefs, behaviors, and barriers of women in mathematics, a holistic approach to advising, counseling, degree and course planning can be used. By studying the beliefs held by women in mathematics courses and the barriers if any that exist in these women's lives, more interventions can be made available to aide in their successful behaviors, completion of mathematics courses, degree completions, and careers in the STEM fields.

Significance of the Problem

Women make up over 50% of the enrollment in college, at a rate of 1.26 females for every male (National Center for Education Statistics, 2014b). An 18 % increase in enrollment of women in post-secondary education is predicted between 2010 and 2021 (National Center for Education Statistics, 2014a). Historically women are stereotyped as not mathematically inclined and although more women are enrolled in college in comparison to their male counterparts, less of them enter into the fields of mathematics and science, possibly by choice rather than ability (Ceci & Williams, 2010a). To obtain an associate's degree, one of the requirements is a college-level mathematics course, and the course that is offered in many institutions of higher education is college algebra (Texas Higher Education Coordinating Board, 2016). Less than 30% of students in community colleges graduate on time. Fifty-two percent pass the first college-level math course, of which college algebra is one of these courses needed to graduate. Fifty percent of students in Texas community colleges are part-time students and most will not graduate, according to the 2013 Complete College Texas report (Complete College America, 2013).

Many students realize the importance of mathematics in the success of their degrees and careers. Less than 50% of students taking mathematics courses to prepare them for advanced mathematics courses and successful careers pass these courses on their first attempt. Disproportionately, many women fall into this category of less than 50% (Stage & Kloosterman, 1995).

The purpose of this research is to recognize and describe the beliefs and motivators of women who are successful in college algebra. Because attitudes and beliefs, abilities, motivations, demographics, support persons (Xia, 2010) and tools can have an impact on course success, it is necessary to profile successful women in these courses from a holistic approach, labeling the people, support systems such as tutoring, mentoring, supplemental instruction, and learning aids that make them successful.

Statement of the Problem

Gordon (2005) stated success rates in the mandated mathematics courses required for non-mathematical degrees show on the order of 50% or less. Because a majority of women are entering college and a significant number of those women are not able to complete the college algebra credit degree requirement, more research needs to be done on exploring the women that are successful and to what they attribute their success. Exceptional individuals have a talent for identifying their own strengths and weaknesses (Gardner, 1997). Colleges and universities offer multiple aids and support systems to all students including supplemental instruction, peer tutoring, computer assisted instruction, along with counseling, advising, and mentoring. Online instruction, hybrid instruction, face-to-face instruction, and differentiated instruction are utilized in the educational system. The United States General Accounting Office (US GAO), assessing the Science, Technology, Engineering, and Mathematics (STEM) education trends in 2014, reported that degrees awarded in STEM fields grew 55% from 1.35 million to over 2 million whereas non-STEM degrees grew 35% since 2004. STEM jobs in electrical and mechanical engineering, actuarial jobs, medical field jobs, such as doctors, nurses, and technicians, and many more are available to students with college degrees. The number of STEM jobs increased 16% from 14.2 to 16.5 million and non-STEM jobs remained fairly constant (US GAO, 2014).

Despite the growth in STEM degrees and jobs, the underrepresentation of women entering the STEM fields is still a source for questioning and research (Ceci & Williams, 2010b).

The merit of this study is its contribution to the limited existing knowledge of placing, aiding, and instructing women in mathematics courses with support, interventions, brain and ability training, and alternative scheduling needed for success. Further, this study will attempt to provide a composite profile of successful women in college algebra and potentially all college mathematics.

- The study will include surveys from rural Texas community college women enrolled in college algebra
- The study will include opinions of the participants about the effectiveness of the support systems
- The study will include the beliefs and behaviors of students as they enter the course
- The study will include demographics of the participants

Research Questions

The following questions will guide the research:

1) What is the relationship of the three math beliefs (math value, math confidence, math barriers) to the performance of women in college algebra?
2) What is the relationship of the three behaviors (class attendance, homework, and use of tutoring) to the performance of women in college algebra?
3) Which demographics are associated with the performance of women in college algebra?

Definitions

- Attitude - a feeling that something is good, right, or valuable; individuals' thought patterns and emotional reactions (Pajares, 1995)
- College-level math - math course assigned college credit by the Higher Education Coordinating Board
- Demographics - participants' characteristics in relation to school and rural environment
- Distance learning - instruction given by instructor through video conferencing, programs or courses offered electronically or off campus (Duran, 2010)
- Educational equipment - computers, calculators, texts, online resources and programs
- Extrinsic factors - methodologies, educational equipment
- Extrinsic motivators - family, peers, school personnel
- Face-to-face – instruction given by instructor with students present within the classroom
- Feeling - an emotional state or reaction
- Females - member of the female sex of any age group
- Intrinsic motivators - self-efficacy, beliefs, and attitude of mathematic value
- Math belief - a person's perception of someone or something (math) (Hendy et al., 2014); feeling or way of thinking that affects a person's behavior and motivation, mediating the relationship between knowledge and action (Pajares, 1995)
- Methodologies - teaching strategies, course deliveries, tutoring and mentoring strategies
- Motivation - belief or judgment that drives a person to perform or complete a task (Bandura, 1982)

- Motivator - a person or instrument who provides a reason, drives or assists a person (desire) to perform or complete a task; drives the behavior that stems from how people judge their capabilities (Bandura,1982)
- Online – all instruction is given online
- Non-traditional woman – a female adult age 25 or older, who has returned to school either full-time or part-time (Ely, 1997)
- Not pass – grades of D (60-69%), F (less than 60%), W (withdrew from class), or Q (dropped from class for excessive absences)
- Pass – grades of A (90-100%), B (80-89%), or C (70-79%)
- School personnel - counselors, advisors, teachers, administrators, support personnel: tutors, mentors, supplemental instructors
- Support systems – tutoring, mentoring, advising, supplemental instruction
- Self-efficacy - a person's belief in oneself and his/her judgment of personal capability to control factors which in turn affect the amount of work one puts forth to complete task, especially in education/math; motivation and behavior that stems from how people judge their capabilities (Bandura,1982)
- Women – females 18 years of age and older

Summary

In this chapter the importance of success of women in college algebra was established. The need for studying the relationships between math beliefs, math behaviors, and math barriers and the performance in college algebra was identified as a necessity for supporting women in the study of mathematics, particularly in the STEM fields. The methodology employed in this study was identified as a quantitative study using a correlational approach to examine the relationships between math beliefs, math behaviors, math barriers, and math performance. The theoretical frameworks were identified as the socio-cognitive theory of Bandura (1982), the socio-cultural theory of Vygotsky (1978, 1930-34), the attribution theory of Weiner (1979) merged with the research of Hendy et al. (2014), based on the expectancy belief model of Wigfield and Eccles (1992) and the health belief models of Janz and Becker (1984).

Chapter II

Literature Review

Introduction

This chapter presents a review of the literature upon which this study was based. The topics reviewed are self-efficacy, affective factors, attitudes and beliefs, attribution, and societal affects.

The United States needs to stay competitive in the global race for power and in the competitive marketplace. The National Commission on Excellence in Education, in its 1983 report *A Nation at Risk,* called for intensified action toward student achievement to meet the demands of the changing nature of jobs, technology influences in careers, changes in demographic characteristics of the population, and the breakthroughs on brain-effective teaching and methodologies (Berns & Erickson, 2001). In order to stay competitive in the global race, college degree completion is an important factor to consider.

Total undergraduate enrollment in postsecondary institutions was 17.7 million in fall 2012, an increase of 48% from 1990 (Ginder & Kelly-Reid, 2013). By 2023 the National Center for Education Statistics (2014a) projects the increase to be 20.2 million. In 2012, there were 10.0 million female undergraduates (56% of total enrollment), and an increase of 18% to 11.8 million females in 2023 is estimated (National Center for Education Statistics, 2014c).

An indicator of college attainment rates in Texas is the rate of degree attainment among young adults between ages 25-34. Goal 2025 sets the Texas goal at 60%, hoping to meet the expected 4 million job vacancies in Texas predicted by the Georgetown University Center on Education and the Workforce by 2018. As of the 2011 census, Texas's college attainment rate was 33.9%. Fifty-six percent of all Texas jobs will require postsecondary education by 2018. The data shows that increasing attainment is a particular challenge in rural counties (U.S. Census

Bureau, 2011). Long-term prosperity is directly linked to education (Murdock, 2014), and the educational level of the Texas population as an aggregate is not improving.

Cognitive and noncognitive foundational skills are important to industry competency models as set by the U.S. Department of Labor. Using these two distinct skill areas gives employers valuable tools for assessing, recruiting, training, and promoting workforce. Cognitive skills involve conscious intellectual effort, thinking, reasoning, and memory. Noncognitive skills relate to motivation, attitudes, and interpersonal interaction (ACT National Career Readiness, 2013).

Knowledge is gained through experiences as the person develops through cognitive states (Piaget, 1972). Piaget defined behavior as an adaptation to the environment controlled through stages of mental development. As a person matures, one adapts to their environment through cognitive structures. With the interaction and influence of one's surroundings and peers (Vygotsky, 1978) the learning process progresses. As a student advances through the learning process, academic motivation stimulates behavior modifications in determining the success of educational goals (Weiner, 1986). The product of education is a successful life (Dewey, 1910) with the teacher's function to construct the environment that supports the growth, development and attainment of knowledge (Noddings, 1992). Noddings holds that liberal traditional education does not provide the best education for everyone because it puts too great a value on rational, abstract thinking, puts too great an emphasis on academic excellence as being superior to other abilities, and does not value the abilities of women. Schools should offer students who represent these differing strengths many options to their learning modalities and curricula that can best serve these strengths. Understanding the perspectives, the goals, and experiences of successful women in college mathematics will help establish strategies to scaffold this success for others.

Self-efficacy

A person must pay attention to performance in order to motivate him or herself and in turn take action, setting realistic goals and evaluating progress. "By analyzing regularities in the covariation between situations and their thought and actions, people can identify the psychologically significant features of their social environment that lead them to behave in certain ways" (Bandura, 1991, p. 250). Altering beliefs and behaviors of women and modifying the learning environment can set into motion corrective changes and provides the basis for purposeful action, which is important to women and their success in school.

Self-confidence and outcome expectation play prominent roles in career interests according to Fouad (2008) in a National Science Foundation study tracking the reasons why many women avoid mathematics. The study suggested that examination of barriers and support relationships may play an important part in the development of strategies to reverse the rapid decline in numbers of women in STEM careers.

One of the barriers that plays a critical role in the teaching and learning of math is math anxiety (McLeod, 1992). Ma (1999) referred to work done in mathematics by Aiken in1960 when he labeled anxiety as a "relative" of one's attitude toward mathematics. Zakaria and Nordin (2007), in their study of anxiety and the effects on motivation and performance, found a significant negative correlation between math anxiety and performance. They also found a significant negative correlation between math anxiety and motivation. The more anxious a student becomes during their mathematical studies, the less motivation they possess to spend time in behaviors required in math classes, which in turn influences the overall performance in math classes.

Knowledge of how one is performing can alter behavior to the extent that personal goal setting and self-evaluation are activated responses (Bandura, 1991). Individuals form standards from how significant people in their lives react to their behavior. They form standards by comparison of performance in relation to success of others. In their study of students' attitudes, understanding, and math anxiety, Jennison and Beswick (2010) studied eighth graders in math classes. The study results showed that poor attitudes and high anxiety are coupled with avoidance behavior and decreased performance. The study recommended teaching interventions in math courses that build confidence in mathematic processes and in turn ease the feelings of anxiety in the students with the final result of better performance. Dweck (2006) suggests that changes in language can influence performance and less effort is needed when one thinks of performance as an innate ability. Students' confidence in their mathematical abilities and the belief that abilities and nurturing of the innate abilities is possible, thus supporting the positive attitude about math ability, lessens math anxiety, and in turn affects performance in math classes.

Affective Factors

Many seminal studies have found affective factors both in the field of learning and education in general and in the specific field of mathematics learning. Even though these studies are dated, they remain the foundation of work being done in the present. McLeod (1992) summarized studies on students learning and development of math attitudes from elementary through high school years. McLeod described the affective factors in mathematics education focused on beliefs about oneself as a learner of mathematics, self-confidence in learning mathematics, and interest or performance in mathematics. Wang et al. (2014) claimed that the genetic risks related to both anxiety and mathematics skills affect the cognitive performance in mathematics and the tendency toward anxiety. The influence of anxiety on academic outcomes is minimized when self-efficacy is included in the model (Pajares & Miller, 1994). Zakaria and Nordin (2007) found relationships between math anxiety and motivation and achievement among second-semester college students. Ma (1999) found low achievement in math was accompanied by math anxiety. Preston (1986) found that math anxiety is related to choice of major in college and has a moderate relation to math achievement. Preston also found the resulting avoidance lowered confidence in math ability related to one's self-rating of math anxiety. The study found a small relationship with math performance. Many studies about math performance and the factors influencing performance have been published and variation in the findings and recommendations exist. Some studies are in agreement about the barriers to math performance and other studies show reciprocal findings. A one size fits all solution does not seem to be a favorable answer to the questions about math and performance.

Cognitive motivational variables influence decisions to enroll in advanced mathematics courses. Meece, Wigfield and Eccles (1990) conducted a three-year longitudinal study of 6th and 7th grade students and found that mathematics ability and perceptions affect students' valuing of mathematics and their expectations for achievement. (Askew, Hodgen, Hossain, & Bretscher, 2010) found that students who were involved in learning scored significantly higher. Preston (1986) found that the major in college was related to anxiety and performance. Students' confidence in their abilities in math, the value of math in majors, and careers affect their choices in behaviors and affect performance. The more support or nurturing of math confidence, math skills, and math values given to students, the more aid in performance. The support to students in coping with anxiety and changing attitudes about math value affect decisions on behaviors and, in turn, affect performance.

Results from the study of university students in a northeastern United States university on math beliefs and behaviors conducted by Hendy et al. (2014) suggested that self-efficacy (Bandura, 1991), expectancy-value (Wigfield & Eccles, 1992), and health belief models (Janz & Becker, 1984) are all useful and significant in measuring mathematics behavior and performance. The math value/devaluation beliefs are most consistently associated with poor math behaviors of attending class, reading the text, doing homework, and seeking help (Hendy et al., 2014). On the other side, mathematics confidence was associated with more attendance, homework, text reading, and asking for help (Hendy et al., 2014).

Four principal sources of information fuel self-efficacy: performance attainments, vicarious experiences, verbal persuasion, and social influences. The higher the degree of self-efficacy, the greater one's performance; both are strong predictors of behavior change and the greater persistence to succeed (Bandura, 1982). Predictability and controllability enhance *self-percepts* of efficacy, reducing stress and increasing preparedness (Averill, 1973; Miller, 1979).

People are influenced more by how they read their performance than by the success itself (Bandura, 1982). One's self-efficacy can be improved. In a study of male and female subjects in 1982, Bandura found that modeling and initial enactive successes showed progressive mastery of tasks, but added success did not seem to increase self-efficacy in female subjects, implying maximal self-perception was reached, whereas in male subjects, each enactive success produced higher levels of self-efficacy.

Attitude and Beliefs

Rives (1992) found that intrinsic factors of locus of control and mathematics attitude had an effect on success in college algebra. Curiel (2010) found self-efficacy and mathematics anxiety had significant effects on mathematics success in college students. Beliefs and behaviors along with self-confidence affect not only math success but retention and success in college (Lotkowski et al., 2004).

Attitude and beliefs are a major part of human identity and are defined as an overall evaluation of an object of thought according to Bohner & Wanke (2002). Students' attitudes towards mathematics have been found to influence achievement in mathematics (Mohamed & Waheed, 2011). The more positive the attitude toward mathematics, the more successful a student is in mathematics. Moreover, the study by Mohamed & Waheed (2011) showed no gender difference in attitudes and success. Josiah and Etuk-iren (2014) found in their study of college students and performance in college algebra that there was no significant difference in performance by males and females. A study by Abubakar and Oguguo (2011) found in their study of mathematics and science students that age and gender were predictors of grade point average (GPA) in the STEM fields. Differing explanations as to why the variation among age, gender, and performance exist. Attitudes being part of a human's identity (Bohner & Wanke, 2002) are influenced by cultural factors, demographic factors, and cognitive factors.

Studies show that three categories of factors influence students' attitudes. Firstly, factors including mathematics achievement scores, mathematics anxiety, self-efficacy and self-concept affect beliefs toward mathematics. Researchers for the Nuffield Foundation (Askew et al., 2010) from studies of countries with high performance in mathematics found that the pupils' confidence in their mathematic ability and their self-perception of math ability may have an impact on performance. Students who performed well in math noted that they enjoyed math, did well in math, and found math easy. Kenney-Wallace (2013) found that college students performed better in math if they possessed strong emotional intelligence skills of time management and emotional coping. Self-confidence and emotional coping skill in mathematics showed positive effects on performance.

Secondly, the school, the teachers' teaching topics about mathematics involving real life enrichment, and the students' opinions about mathematics prove to have an effect on attitude. Végh (2000) suggested that a desirable climate of secondary schools had positive effects on the behavior of teachers and students. Goldstein (1999) stated that the importance of the teacher and the support and encouragement given, motivates students to understand and achieve. Goldstein (1999) described the caring learning-environment as the foundation point of intellectual growth.

The caring teaching environment in higher education has power over learning, reminding instructors that students are whole persons, bodies, hearts, souls, as well as minds and that these integrated aspects must considered in instruction (Thayer-Bacon, Arnold, & Stoots, 1998). Robicheaux (1996) described the effect that caring had on the teaching of mathematics and the need to encourage a caring classroom environment that promotes success. Levi (2000) stressed that one of the roles of teachers was to work toward gender equity within the math class, encouraging both males and females, equally supporting the math abilities of each student, and building favorable attitudes toward mathematics in both genders.

Lastly, the environment and society (Tobias, 1993), family, and peers play a crucial role in attitude formation. Kane and Mertz (2012) stated that children are self-selective, and the stigma held in the United States is that math is hard and feared and therefore not to be attempted. Parents with realistic expectations of their son's/daughter's mathematical attainment had more impact on the student's learning than parents with unrealistic demands (Askew et al., 2010; Maloney, Ramirez, Gunderson, Levine, & Beilock, 2015) and direct involvement of the parent is positively associated with student attainment, but the impact of the help varies with age of the student and the grade level of the student. Family size was found to be significantly correlated with academic performance, parents of smaller families devoted more time and assistance to their children's academic studies (Abosede, 2015). Studies on the correlation of marital status and academic performance (Thomas, Raynor, & Al-Marzooqi, 2012; Duke et al., 2015) showed that there was a positive correlation between marital status and performance, married students showed better performance. In the study of employment status of students during school years (Warren, Lepore, & Mare, 1997) moderate employment (15 hours or less per week) had a positive effect on grades, but students working excessive hours (more than 15 hours per week) showed poorer performance in academic work. Askew et al. (2010) showed that high attainment may be much more closely linked to cultural values of the importance of testing, learning mathematics, and usefulness of mathematics than to specific mathematics teaching practices. Traditional approaches only appear to succeed because of cultural support and through parental expectations and relatively homogeneous populations. Studies and findings vary from study to study and from country to country and many variables: age, gender, family size, marital status, fields of study, and employment are involved in academic performance.

Attribution

Standards are formed when accomplishments are attributed to one's own ability and effort (Bandura, 1991). Pajares and Miller (1994) found that mathematics self-efficacy had stronger direct effects on problem solving performance than did self-concept and high school level mathematics. Pajares (1995) states that "self-efficacy influenced performance almost exclusively directly and also mediated the effects of gender and prior experience on self-concept, perceived usefulness, and problem-solving performance" (p. 15). Motivation and concentration are factors in mathematics achievement (Saritas & Akdemir, 2009). Despite the lower level of self-efficacy levels in women, achievement level differences in mathematics and other STEM areas are diminishing (Eisenberg, Martin, & Fabes, 1996). The need to describe success in women in college algebra is a key to self-regulation and success, a key to advising and support services, and a key to degree completion and career success.

Extrinsic factors are linked to an intrinsic mediator system that in turn stimulates overt behavior (Bandura, 1982). A set of complex factors influence mathematics performance (Singh, Granville & Dika, 2002). Attitude is regarded by researchers as an important key belief in understanding performance in mathematics. Fraser and Kahle (2007) found that individual experiences, interaction with other people at home, at school, and within peer groups play an important part in influencing students' attitudes. Mohamed and Waheed (2011) identified three groups of factors of secondary students in an international school in Maldives and found that three factors influence attitude: 1) intrinsic student attitudes of self-efficacy, anxiety, motivations, mathematical achievements, and experiences in school; 2) extrinsic factors associated with the school, teachers, and materials within the school; and 3) attitude toward mathematics from home and society

Instructional design must link the crucial factors that affect student learning with the goals and student performance. Instructional strategies and methods as well as teacher competency in mathematics education are influential factors in mathematics achievement (Saritas & Akdemir, 2009). McLeod (1992) found that instructors and their communication of mathematics ideas proved to be an affective factor in mathematics success. Gender role socialization described by Leder (1992) is a factor found to affect female students. Fennema and Peterson (1985) suggest that there is a direct influence on student beliefs and mathematics achievement. Teachers have been found to be the major source of influence on female students and their decisions to pursue mathematical majors in college (Gavin, 1996; Rossi Becker, 1992). Jennison and Beswick (2010) emphasized that hands-on and interactive math in a relaxed and supportive situations helped improve the students' understanding and confidence in math.

Societal Affects

Jensen and Seltzer's individual study (cited in Saritas & Akdemir, 2009) found that parents' role and social environment have significant influence on further educational decisions and achievements. Students who are supported by parents' positive beliefs in education and parents' values of mathematics inherit these standards. Research shows that teachers' and parents' expectations strongly influence the outcomes of a child's self-confidence and performance (Frome & Eccles, 1988).

Delivering systems and modalities of instruction are growing along with the world population (Shih & Gamon, 2001). Not only do the teachers' expectations and presentations affect the learning process, but they also affect the beliefs and learning styles of the students. Learning styles consist of a combination of motivation, engagement, and cognitive processing habits according to Curry (1990). Beliefs and behaviors of parents and teachers must support and provide scaffolding for the beliefs and behaviors of the student. Peer collaboration in the learning environment that is carefully planned and coordinated can increase persistence rates towards graduation (Arendale, 2000). Peer beliefs and behaviors can support and enhance learning. With the expanding world and the need for delivery systems to meet the growth, a web-based delivery may be used in a course. Studies about learning styles and methods of course delivery find varying results regarding learning styles or attitudes towards web-based instruction and whether they have an effect on student achievement (Wingenbach, 2000). In a later study by Atchley, Wingenbach, and Akers (2013), archived information on success rates and retention rates varied among college students and their fields of study.

By adding meaningful engagement and interaction, student success rates can be improved (Reed, 2015). Most students want to be included and need support. Social inclusion and supportive environment where teachers and students interact in a cohesive plan to ensure success are recommended by Colton, Sanders, and Williams (2001) and Tinto (1993). Female students in particular seem to benefit from social inclusion and the supportive nature of cooperative education (Fennema & Peterson, 1985). Hands-on, active learning and involvement is important to women in learning mathematics (Fennema & Sherman, 1976).

Research and theories concerning learning, success, and mathematics have been in the academic world for decades. Further understanding and examination of the beliefs held by women involving self-efficacy, positive values placed on mathematic learning, and defenses needed to overcome barriers toward learning mathematics are needed. Within this study, questions will be asked in hopes of clarifying the beliefs of women successful in mathematics.

The National Postsecondary Education Cooperative report, *What Matters to Student Success: A Review of the Literature* (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006), summarized that the college experience and what matters to success is a composite of student behaviors and institutional conditions, student engagement, student-faculty contact, active and collaborative learning, and inclusive and affirming institutional expectations of performance.

Summary

Considering all the studies written about students and their beliefs and behaviors in learning mathematics over the last 40 years, merged with thirty years of teaching experience at multiple grade levels, the researcher planned this study to examine an important subset of the present day student population. Recognizing the need for women in STEM fields and the large number of women in college able but not entering the STEM fields, this study was intended to examine and describe the beliefs about mathematics, the behaviors required to succeed in mathematics, and the demographics of women successful in the gate-keeper mathematics course, college algebra, in a rural community college in South Texas. A large amount of research exists, but little has been written about women in rural areas in colleges in South Texas. This population of women students is an important and interesting portion of students in Texas. The affective factors of performance in mathematics and the views of society, family, teachers, and women themselves that math is difficult and not to be attempted by many women needed to be considered and described so that colleges and universities could plan support systems and interventions to aid women in succeeding in mathematics, their degrees, and their careers. The survey, *Three Measures of Math Beliefs and Behaviors* (Hendy, 2015) was used as a basis to examine the beliefs about mathematics and their effect on performance of women in mathematics, the first question posed by this study. Data describing the behaviors of attendance, doing homework, and using tutoring services exhibited by the women in this study were gathered from instructors of the college algebra courses and were compiled to answer the second question posed by this study: Which behaviors of women in mathematics had a significant effect on performance? Demographics that had been shown to be significant factors in performance in mathematics by past studies, along with the researcher's observations of demographic factors of students in the rural South Texas community college that might make significant contributions to the performance of women in mathematics were chosen to answer the third question in this study: Which demographics are associated with the performance of women in college algebra?

Chapter III

Methodology

Introduction

This chapter presents the methodology including the research design, sampling procedure, participants, instrumentation, and data analysis. The purpose of the quantitative study is to develop a model for predicting college algebra success among community college females in South Texas rural communities by identifying math beliefs and behaviors utilizing a logistic regression model. The use of multiple forms of data in survey methods studies combine the quantitative data and data collected from other methods rather than keeping them separate, which results in confirmation of earlier findings. This combination leads to maximizing the strengths of the quantitative data and minimizing the weaknesses. Cresswell and Clark (2011) state that using quantitative and other forms of data provide a better understanding of the research problem.

The study is guided by the following research questions:

1) What is the relationship of the three math beliefs (math value, math confidence, and math barriers) to the performance of women in college algebra?

2) What is the relationship of the three behaviors (class attendance, homework, and use of tutoring) to the performance of women in college algebra?

3) Which demographics are associated with the performance of women in college algebra?

In order to identify the relationships between beliefs, behaviors, and performance, regression methods are integral components of data analysis, describing relationships between the independent variable and the dependent variable(s) (Hosmer & Lemeshow, 2000). Logistic regression is multiple regression with an outcome variable that is a categorical variable and predictor variables that can be categorical. This technique can not only find the variables that predict success in college algebra, but can predict whether a new person is likely to be successful in college algebra (Field, 2009). For this study, the outcome measure (dependent variable) is the college algebra success. College algebra success is a binary variable defined as completing the course with a grade of A, B, or C, or not completing the course with a grade of D, F, W, or Q. The three elements of this study, independent predictor variables, are the math beliefs of math value, math confidence, and math barriers.

Research Design

The study employs a correlational design (Gall, Gall, & Borg, 2007). Students who earn a letter grade of an A, B, or C in college algebra constitute the characteristic-present group and those students earning an D, F, W, or Q serve as the comparison group. Comparisons were made between the characteristic-present group and the comparison group trying to identify relationships that could exist between the dependent and independent variables. No causal inference may be made since the independent variables were not manipulated, but possible relationships between the variables could be identified (Cohen, Manion, & Morrison, 2007).

A survey was conducted using Hendy's (2015) survey, *Three Measures of Math Beliefs in College Students.* The survey consisted of 28 Likert scale questions that examined for the predictors of mathematic value, mathematics confidence, and mathematics barriers and 11 short answer questions relating to demographic aspects of the participant. According to the *Explanatory Design: Follow-up Explanation Model* as described by Cresswell and Clark (2011), the emphasis on collecting and analyzing quantitative data with further collection of demographic data can explain the quantitative results. The demographic questions were directed toward aspects of the student's life that may project as a barrier to performance in college algebra.

Sampling Procedure

The study took place in a rural community college in South Texas. The college is composed of a main campus, hereafter to be referred to as “the college,” and three rural sites, hereafter referred to as “sites.” The study used a convenience sample and was delimited to all female students enrolled in college algebra in the fall 2015 semester at the college and its sites as either face-to-face, online, and/or distance-learning students. No student under the age of 18 years took the survey, and classes taught at local high schools for the college or its sites were not used in the study. The target population is multicultural, composed primarily of non-Hispanic white students and Hispanic students of Mexican ancestry.

Those face-to-face and distance- learning students attending class who agreed to participate took the survey in early October 2015 on the days and that the researcher introduced the study. Online students and students not present at the time that the researcher introduced and invited participants also served as part of the sample and were invited to participate online within the two-week period. All students, 18 years of age and over, were given the opportunity to participate in the survey, but only the data from the female population were used in the study. Approximately twelve sections of college algebra with a twenty-five to thirty student capacity were offered in the fall of 2015 at the college and its sites through face-to-face, online, or distance-learning. Since the National Center for Educational Statistics (2014c) showed the number of female undergraduates to be 56% of total enrollment in 2012 and projected an increase of 18% by 2023, the proposed targeted population for this study met the projection rate with 125-150 female participants.

The survey was prepared and delivered through the online Qualtrics® survey instrument. Qualtrics® is an online data platform for collecting and analyzing research data.

Participants

All students enrolled in college algebra in the fall of 2015 at the college and sites received an e-mail (see Appendix B) prepared by the researcher introducing the purpose of the study and inviting students to participate. The e-mail contained a consent statement verifying that the student's participation in the survey would serve as his/her consent for data from the study to be used by the researcher. The e-mail introducing and inviting students to participate in the study was delivered through the Pearson My Math Lab® program. The use of the Pearson My Math Lab® program (Pearson Higher Education, 2015) is a requirement of all students enrolled in college algebra at the college and its sites.

The researcher visited each face-to-face and distance learning class to introduce the purpose of the study and to invite students to participate. The researcher also guided the students through the e-mail and assisted students who participated to log into the survey. The instructor of record proctored the survey administration so as to minimize any anticipation of coercion by the researcher.

One section of college algebra in fall 2015 was taught by the primary researcher. A substitute instructor was employed to proctor the survey in this class. At no time were the students' grades in the class or status at the college and/or its sites affected by participation or non-participation in the study. The identity of the participants is known only to the primary researcher solely for the purpose of identifying the number of students passing the class, and the number of the comparison group, students not passing the class and their relationship with the independent variables in the study.

Instrumentation

Permission was granted by the Internal Review Board (IRB) of the university and the review board of the college and sites at which the study was performed. The Dean of Academics and the chair of the Science Department and coordinator of the Mathematics Department of the college permitted the researcher to invite college algebra students to participate in the survey and to ask instructors of the college algebra classes to permit the researcher to introduce the survey to the classes. The instructors also served as proctors for the survey to limit any feelings of coercion to participate.

The study instrument (see Appendix A) was a survey composed of 40 short answer and Likert scale items. The survey used was *The Three Measures of Math Beliefs in College Students,* designed by Hendy (2015) and was composed of a 10-item Math Value Scale (MVS), a 7-item Math Confidence Scale (MCS), and an 11-item Math Barriers Scale (MBS).

The last 11 questions of the survey were added by the researcher to identify items examining demographic factors of the participants that might pose as barriers to performance in college algebra as described in earlier studies (Abubakar & Oguguo, 2011; Thomas et al., 2012; Warren, LePore, & Mare, 1997). The demographic questionnaire was used to collect personal and professional data from the participants. The participants were asked questions about their age, ethnicity, work hours, number of children in family, zip code, and degree plan.

The items were coded by their purpose in identifying mathematics value, math confidence, and mathematics barriers. Individual and social support factor and beliefs, family, teachers, peers, college support personnel, methods of instructional delivery, and educational support instruments were examined in hopes of maximizing the strength of the quantitative data.

Data Analysis

A panel of five experts, university professors from the education and human development department, examined the survey for validity. The internal reliability of the survey was tested by Hendy et al. (2014) and found to be above the recommended 0.70. Muijs (2004) recommends this effective strategy would minimize problems with the survey and validate its purpose.

Inferential and descriptive statistical procedures were used to determine any relationship between the independent and dependent variables. Descriptive analysis to describe the data and logistic regression statistical techniques using the Statistical Package for the Social Sciences (SPSS®) (IBM Corporation 2014) was used to construct models connecting success in college algebra with the predictor variables to be studied.

Frequency and percentage tables, including measures of central tendency (mean, median, and mode), are presented. Measures of variability (standard deviation, variance, and range) summarize and organize the data.

The participant's responses to the Likert scale items were checked for reliability (internal consistency) using the Cronbach's Alpha coefficient. All quantitative/measurement predictors were checked for normality. The correlation (association) between each predictor variable and the outcome measure, and the collinearity statistic, were computed for each predictor variable.

Given that the outcome variable was dichotomous logistic regression was chosen to be the statistical tool for the analysis of results. Logistic regression studies in which there are several predictors will have an equation for b_n, the regression coefficient of the corresponding variable X_n. Logistic regression will predict the probability of Y occurring, given the values of several predictor variables (X). The multiple regression equation that was used when there are several predictor variables determining the probability of Y occurring (the probability that a case belongs in a certain category) is as follows:

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_n X_n)}}$$

(Field, 2009, p. 266)

Where b_0 is a constant, X_1 is first a predictor variable with a coefficient attached to that predictor b_1, similarly for remaining predictors and associated coefficients. The mathematical constant that is the base of the natural logarithm is *e*. It is approximately equal to 2.71828. *Y* is the outcome measure/outcome variable.

The use of the logistic transformation mode is used to express non-linear relationships. The values of the equation vary between 0 and 1. Values close to 0 mean that *Y* is very unlikely to occur and values close to 1 mean that *Y* is very likely to occur. By using the regression model in logarithmic terms (called *logit*), the problem of violating the assumption of linearity will be overcome (Field, 2009, p. 267).

Summary

This quantitative study utilized a correlational design in order to investigate beliefs and behaviors that might predict success of women in college algebra in rural community colleges in South Texas. Participants were chosen from a rural South Texas community college and its three rural sites. Data was collected in hopes of developing a model to explain the statistically significant relationship between the outcome variable of success in college algebra to the independent predictor variables of math value, math confidence, and math barriers to success. Predictor variables of behaviors, attendance, homework, and time in tutoring, were also examined for significant relationship to success. Societal and academic support factors involving family, teachers, peers, academic support personnel, methods of course delivery and educational support equipment are examined in hopes of maximizing the strengths of the data.

Chapter IV

Analysis of Data

This chapter presents the analysis of this study. It includes a description of the population who completed the survey, analysis of beliefs, behaviors, and demographics. With women being the majority of students enrolling in colleges and universities, and with the ever-growing need for STEM majors, the importance of identifying the beliefs and behaviors of women is significant to the support given by the educational system. Examination of the beliefs and behaviors of women enrolled in mathematics, a key gate-keeper in degree and job attainment, can help colleges and universities better provide for these women. Profiling math beliefs, co-existing behaviors, and demographic characteristics of women against their performance in math is of utmost importance to the success of education and to completion of their professional goals.

Introduction

The purpose of this quantitative study was three-fold: the first to examine the relationship of the performance of women in college algebra against the three beliefs of math value, math confidence (self-efficacy), and math barriers. The second was to examine the relationship of the performance of women in college algebra with the three behaviors of class attendance, homework, and use of tutoring. The third and final purpose was to describe the demographics associated with the performance of women in college algebra. The procedures described in Chapter III were completed by analyzing the data collected in this study.

Survey

The survey used for this study, *Three Measures of Math Beliefs in College Students* (Hendy, 2015) was designed and psychometrically tested by Hendy et al. (2014) at a university in the northern part of the United States. The survey consists of three sections of questions. The first 10 questions are called Math Value Scale (MVS), using a Likert scale to evaluate the math value beliefs of students. The MVS questions have values of 1 to 5 with 1 equal to *strongly disagree* and 5 equal to *strongly agree* (see Appendix A). The questions are stated in negative value terms as: “I can learn without coming to class”; “I can learn without doing homework”; “There is no future math value to my profession”. The second group of seven questions, called the Math Confidence Scale (MCS), uses the same 5-point Likert scale to ask for responses to beliefs about confidence in one’s math ability and the ability to be successful in math on second attempts at learning, testing, or course completions when the first attempt was not successful. The final group of 11 questions, called the Math Barriers Scale (MBS), uses the 5-point Likert scale for responses to questions about math anxiety, discouraging words, negative experiences, beliefs learned from or held by other people in the family, peer relationships, and relationships with school personnel.

The last 11 short-answer and multiple-choice questions added to the survey for this study were questions examining characteristics common among the women in the study describing physical characteristics that might have an effect on their performance in school. The questions were designed for examining the demographic characteristics of the participants in this study in a rural community college in South Texas: age, zip code, campus attended, classification in college, gender, number of hours employed, number of children being cared for in household, number of miles driven to campus, marital status, area of study, and ethnic identity. The student ID was used only for the purpose of connecting grade, attendance, homework average, and tutoring hours with the responses given in the survey. At no time was the identity of the student revealed or used in this study.

Data Analysis

The initial population for this study consisted of all students enrolled in college algebra during the fall semester of 2015 in a rural South Texas community college. All students, 18 years of age and older, enrolled in college algebra during the fall 2015 semester were invited by e-mail (see Appendix B) and by a face-to-face introduction of the study and invitation to participate (see Appendix C). Students in online classes were invited to participate through an e-mail introduction and invitation to participate. Of the 475 students enrolled in college algebra during fall 2015, 187 eligible students consented to participate and completed the survey. Data was collected and was analyzed for this study.

Population

The adjusted sample (N=107) included only female respondents who completed the survey with correct identifiable student ID allowing the correlation of final course grade and responses to correct identifiable student ID allowing the correlation of final course grade and responses to survey. The student ID was used only to connect survey responses with final grade, attendance, homework average, and tutoring hours. At no time was the identity of the student revealed or used in this study. One hundred twenty-six surveys were completed but 19 of them were not used due to incorrect coding of student ID.

Table 4.1 describes the racial or ethnic identity of the population, which consisted of 75.7% Hispanic women (81 students) and 24.3% non-Hispanic women (26 students). The non-Hispanic women subcategorized as American Indian 0.9% (1 student), Black or African American 2.8% (3 students), Caucasian not of Hispanic origin 16.8% (18 students), Asian or Pacific Islander 0.9 % (1 student), and Other 2.8 % (3 students).

Table 4.1

Ethnicity

*Ethnicity	Number of Students**	Percentage of Students
American Indian or Alaskan	1	.9
Native Hispanic or Latino	81	75.7
Black or African American	3	2.8
White or Caucasian/Not of Hispanic Origin	18	16.8
Asian or Pacific Islander	1	.9
Other	3	2.8
Total	107	100.0

*Ethnicity as reported ** Women students in the study

Since the majority of the 107 women in the study were of Hispanic ethnicity, recoding to two ethnic descriptions, Hispanic and non-Hispanic, was used in the correlation studies. Table 4.2 shows that 75.7% (81) women were of Hispanic origin and 24.3% (26) women were a combination of all the other ethnicities represented in the study.

Table 4.2

Ethnicity Recoded

Ethnicity	Number of Students	Percentage of Students
Non-Hispanic	26	24.3
Hispanic	81	75.7
Total	107	100.0

In Table 4.3, 92 of the 107 (86%) women were between the ages of 18 and 25 years of age. Fifteen of the 107 (14%) women were 25 years of age or older. The majority of women attending college algebra in the fall of 2015 were between 18 and 25 years of age, showing a young population in this study.

Table 4.3

Range of Age

Age Range	Number of Students	Percentage of Students
Older than 25	15	14.0
18 to 25	92	86.0
Total	107	100.0

The number of women recorded by classification as semester-in-college students were 31.8% first-semester (34/107). Second-semester students were 11.2% (12/107). Third-semester students accounted for 28% (30/107) and 12.1% (13/107) were noted as fourth-semester students. Students declaring more than four semesters in college accounted for16.8% (18/107) (see Table 4.4). The larger percent of women were first-semester students with 31.8% followed by third-semester students with 28%.

Table 4.4

Classification by Semester in College

*Semesters in College	Number of Students	Percentage of Students
First Semester	34	31.8
Second Semester	12	11.2
Third Semester	30	28
Fourth Semester	13	12.1
More than Four Semesters	18	16.8
Total	107	100.0

*The number of college semesters attempted

Table 4.5 shows the number of hours worked on a job outside of school. All students in the study worked. Less than 10 hours per week for 46 of the 107 women (43%), 10 to 20 hours of work per week for 25 women (23.4%), 21 to 30 hours per week for 17 women (15.9%), and 31 or more hours per week for 19 women (17.7%) was reported. The majority of women were not full-time employees of a business outside of college.

Table 4.5

Hours Worked Per Week

Hours Worked per Week	Number of Students	Percentage of Students
Less than 10 hours	46	43.0
10 to 20 hours	25	23.4
21 to 30 hours	17	15.9
31 to 40 hours	13	12.1
Over 40 hours	6	5.6
Total	107	100.0

Table 4.6 shows 47.7% of women drove 10 or fewer miles to campus to attend college algebra, with the total of the other delineations of mileage being the majority, 52.3%. Fifty-one of the 107 women (47.7% of students) drove ten or fewer miles to campus. 15.9% (17 students) drove 11-20 miles to campus. 18.7% (20 students) drove 21-30 miles to campus, and the remaining 17.8% (19 students) drove more than 30 miles to campus for classes.

Table 4.6

Distance from Campus

Distance from Campus	Number of Students	Percentage of Students
10 or fewer miles	51	47.7
11 to 20 miles	17	15.9
21 to 30 miles	20	18.7
More than 30 miles	19	17.8
Total	107	100.0

Table 4.7 shows the number of children cared for by the women while attending class. The majority of women cared for two or fewer children while enrolled in college algebra during the fall semester 2015. Approximately 90.7% of the women (97/107) had two or fewer children that they cared for while attending class. The remaining 9.3% of the women (10/107) cared for more than two children while attending class.

Table 4.7

Number of Children

Number of Children	Number of Students	Percent of Students
0 to 2	97	90.7
3 to 4	9	8.4
5 to 6	1	.9
Total	107	100.0

The majority of women enrolled in college algebra and submitting the survey are single. Table 4.8 shows the marital status of the women, with 9.3% (10/107) being married, 86.9% (93/107) women being single, and 3.7% (4/107) choosing the category of other.

Table 4.8

Marital Status

Marital Status	Number of Students	Percentage of Students
Married	10	9.3
Single	93	86.9
Other	4	33.7
Total	107	100.0

Table 4.9 shows the areas of study in which the women were enrolled while in college algebra during the fall semester of 2015. The majority of the 107 women in the study, 52.3 % (56 students), were in the science field of study, the second largest group of women, 29% (31 students), were undecided in their field of study. The remaining fields of study were education 10.3% (11/107), mathematics 0.9% (1/107), philosophy/psychology 4.7% (5/107), and kinesiology 2.7% (3/107) students.

Table 4.9

Area of Study

Area of Study	Number of Students	Percentage of Students
Education	11	10.3
Science	56	52.3
Mathematics	1	.9
Philosophy/Psychology	5	4.7
Kinesiology	3	2.8
Undecided	31	29.0
Total	107	100.0

An overall description of the population of women participating in the study and enrolled in college algebra during the fall semester 2015 is a group of young 18-25 year old women, of Hispanic ethnicity, unmarried with 2 or fewer children under their care, living within 10 miles of campus, working 10 hours per week or less, and studying in the field of science.

Beliefs

According to Hendy et al. (2014), identification of math beliefs would supply information toward intervention efforts to improve college students' performance in math. Descriptive statistics, internal reliability, and analyses of covariance were used to examine the responses of the students in this study.

Table 4.10 shows the passing/not passing rates of the women in college algebra in the fall semester 2015. Ninety-one out of 107 passed the course with a grade of A, B, C (85%) and 16 out of 107 did not pass the course with a grade of D, F, Q, W (15%).

Table 4.10

Pass/Not Pass

Performance	Frequency	Percentage
Not Pass	16	15.0
Pass	91	85.0
Total	107	100.0

The purpose of this study was to examine the relationship of math beliefs of math value, math confidence (self-efficacy), and math barriers with the performance of women in college algebra. No significant correlation between any of the three math beliefs and the Pass/Not Pass performance of women in college algebra was observed. (see Table 4.11)

Table 4.11

Correlations for Beliefs and Performance

Math Belief		Math Value	Math Confidence	Math Barrier	Pass/Not Pass
Math Value	Pearson Correlation		.340**	-.065	.122
	Sig. (2-tailed)		.000	.503	.211
Math Confidence	Pearson Correlation			-.587**	.134
	Sig. (2-tailed)			.000	.169
Math Barrier	Pearson Correlation				-.120
	Sig. (2-tailed)				.218
Pass/Not Pass	Pearson Correlation				
	Sig. (2-tailed)				

N = 107 ** Correlation is significant at the 0.01 level (2-tailed)

Since no significant correlations were found, it was not possible to build a logistic model as planned. Numeric grades were further analyzed and the boxplot showed outliers found that may have skewed the data. (see Figure 4.1)

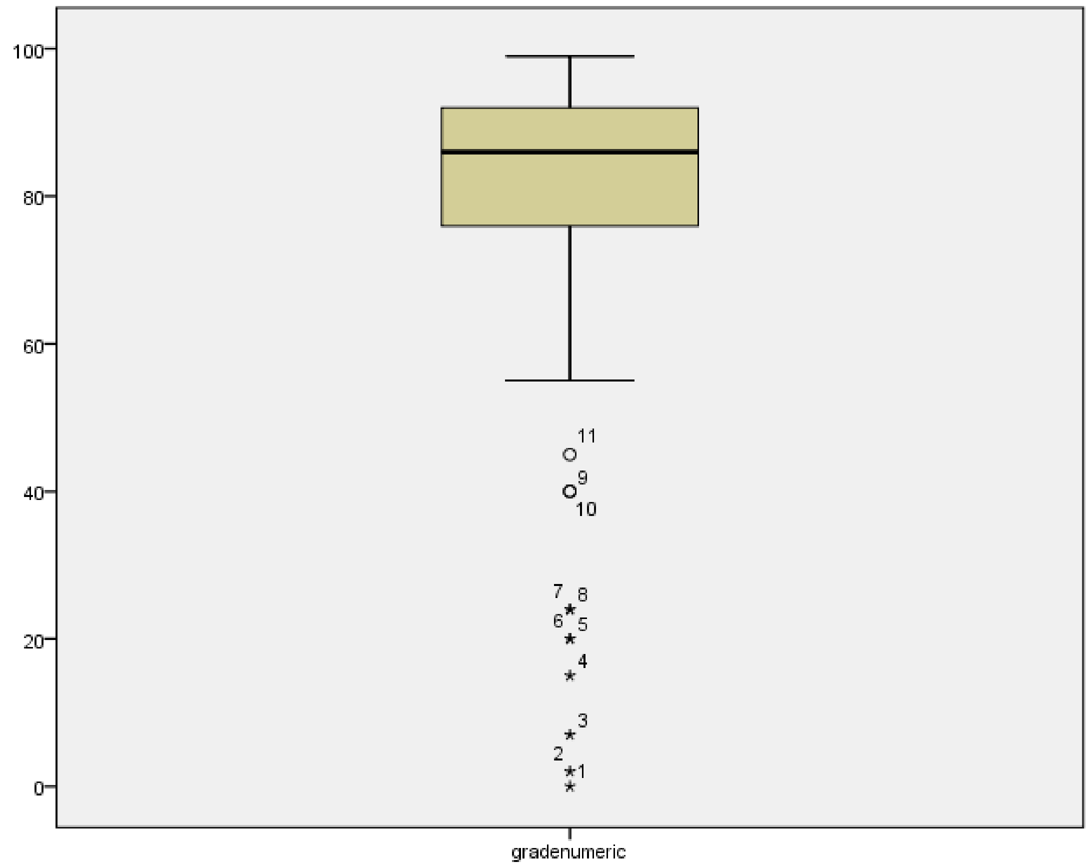

Figure 4.1
Numeric Grades with Outliers

Table 4.12 shows the correlations among the subcategories of math beliefs. Math value was described by Hendy et al. (2014) as having two subcategories of class devaluation and no future value. Math confidence was found to have no subcategories. Math barriers were found to have two subcategories of discouraging words and math anxiety.

The math value and math confidence relationship was significant to the $p < 0.01$ level. The math confidence and math barrier relationship was negatively correlated and significant to the $p < 0.01$ level. (see Table 4.12)

Upon further analysis of correlation between math beliefs and belief subcategories, Table 4.12 shows the correlation between the subcategories of beliefs: class devaluation, no future value, math confidence, discouraging words, and math anxiety. As the no future value belief increased, so did the math anxiety and discouraging words beliefs. Confidence in math showed a significant negative correlation with math anxiety, p < .01.

These correlations were checked for internal reliability and were found to be similar to results of work done by Hendy et al. (2014) in a university study of both men and women in the northern United States. Table 4.12 shows reliability and correlation values for the subcategories of beliefs from the present study.

Table 4.12

Reliability and Correlations for Beliefs

Reliability	**Beliefs**	**1**		**2**	**3**		
	Subcategory	1a	1b			3a	3b
.784	**1. Math Value**	.895**	.590**	.340**	-.065	.077	-.106
.864	1a. Class Devaluation		.168	.467**	-.215**	-.042	-.245**
.640	1b. No Future Value			-.095	.243*	.247*	.210*
.879	**2. Math Confidence**				-.587**	-.405**	-.571**
.903	**3. Math Barriers**					.700**	.970**
.851	3a. Discouraging Words						.505**
.902	3b. Math Anxiety						

* Correlation is significant at the p<.05 level ** Correlation is significant at the p<.01 level

Significant correlations were found among the subcategories of beliefs, further verifying correlations between beliefs and subcategories of beliefs (Table 4.12). Math value was significantly correlated at the p < .01 level with class devaluation, no future value, and math confidence. A positive correlation exists between class devaluation, no future value of math, and the confidence level of the student in math: The lower the value of math belief, the lower the confidence level and its inverse situation.

The class devaluation belief was negatively correlated with math barriers and math anxiety at the $p < .05$ level, and the no future value belief was positively correlated with math anxiety and discouraging words. The less value placed in math, the greater the anxiety and the greater the belief that barriers existed that affected the class.

Although the beliefs did not show a significant effect on grade performance in this study, the correlations between the beliefs and attitudes of the students were significant, which previous studies of Geist (2010) and Blazer (2011) suggest, should have an effect on performance. The pass rate for this study was 85% and the pass rate for women over 18 years of age for the total enrollment in the course was 79% (176/222 women over 18 years of age).

Behaviors

The second question posed in this study was as follows: What is the relationship of the three behaviors, class attendance, homework, and use of tutoring to the performance of women in college algebra? The class attendance, homework average, and the number of hours of tutoring were reported by instructors for each of the participants and are described in Table 4.26.

Attendance showed absences ranged from 0 to 17 class periods out of the 32 class period semester (see Figure 4.2). Each class period was approximately 80 minutes. The mean for the absences was 3.62 class periods per semester.

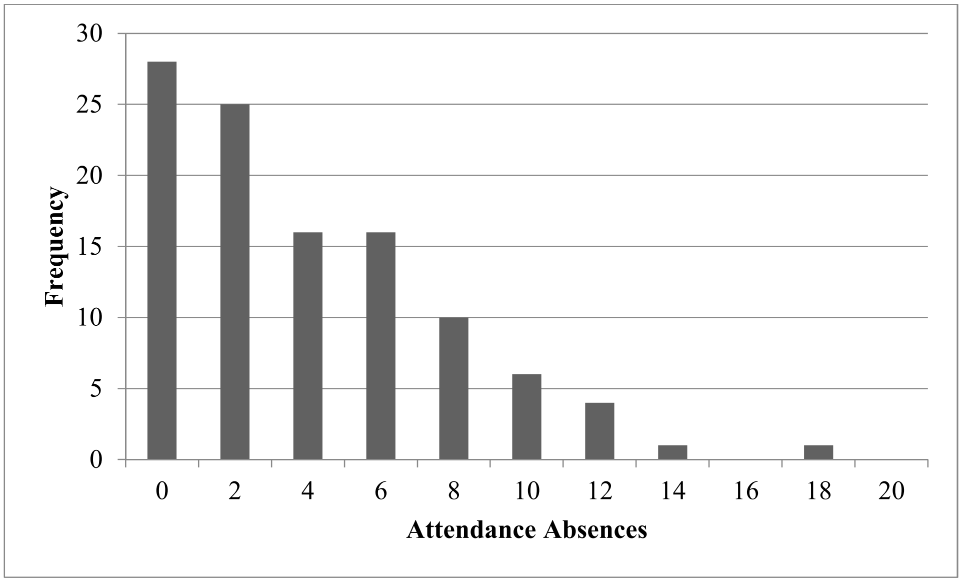

Figure 4.2

Attendance/Absences

Figure 4.3 shows homework averages ranged from 0% to 100%. A mean score of 86.71%, a passing grade of B was shown for 91 /107 of the students.

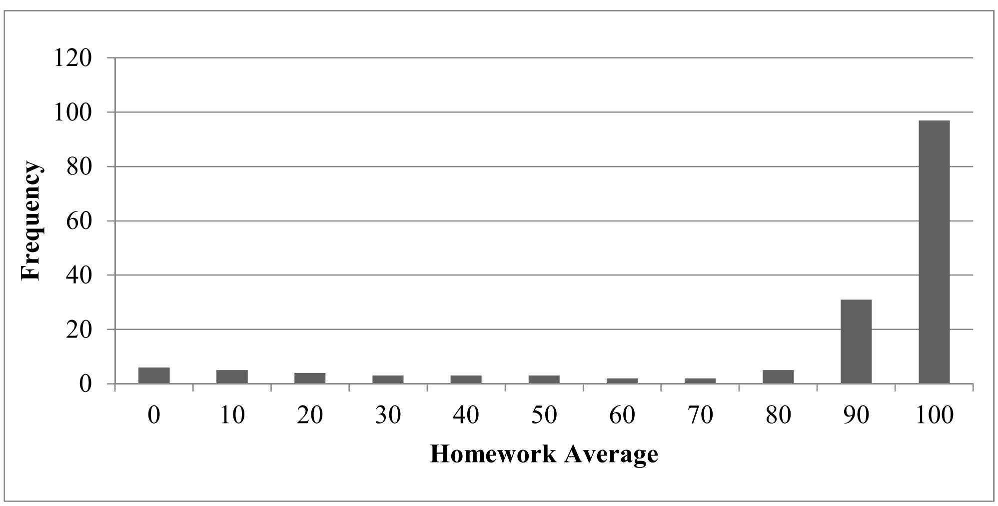

Figure 4.3

Homework Average

Figure 4.4 shows that of the 107 participants in the study, less than 20% took advantage of free tutoring offered by the schools. The number of hours that these women were tutored by the school service ranged from 1 hour per semester to 44 hours per semester (see Figure 4.3). Independent tutoring not provided by the school was not recorded. The number of tutoring hours varied among the students with the students having the most absences receiving more tutoring.

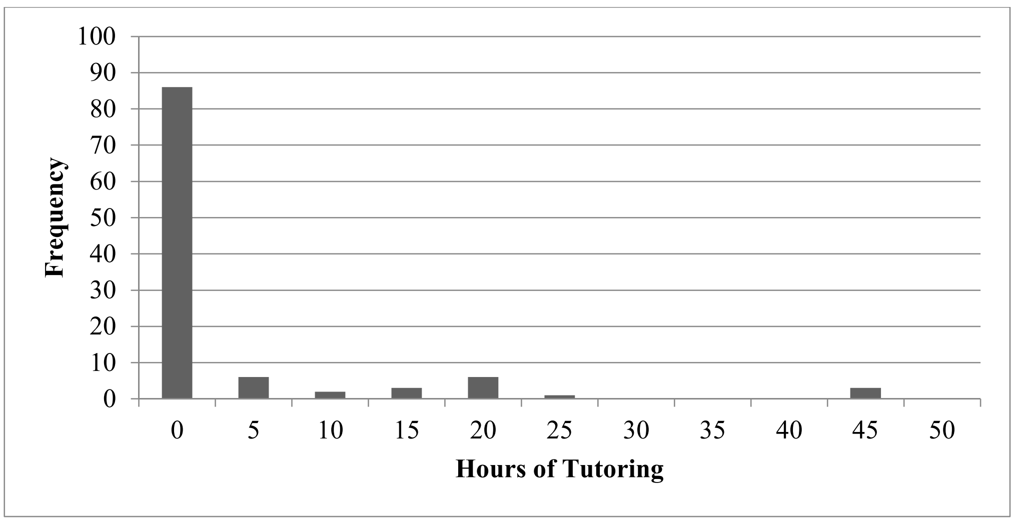

Figure 4.4

Hours of Tutoring

Correlation between homework and performance was highly significant at the $p<0.01$ level (see Table 4.13). Although the Pearson correlation was not significant for absences, a negative correlation showed that the more absences, the lower the performance grade in the class. A positive correlation between tutoring hours and performance was not significant.

Table 4.13

Correlations for Performance, Attendance, Homework and Tutoring

Behaviors		Absences	Homework Average	Tutoring Hours	Pass/Not Pass
Absences	Pearson Correlation		-.089	-.035	-.173
	Sig. (2-tailed)		.363	.721	.075
Homework Average	Pearson Correlation			.090	.707**
	Sig. (2-tailed)			.356	.000
Tutoring Hours	Pearson Correlation				.150
	Sig. (2-tailed)				.123
Pass/Not Pass	Pearson Correlation				
	Sig. (2-tailed)				

N = 107 **Correlation is significant at the 0.01 level (2-tailed)

To summarize the behaviors (attendance, homework, and tutoring,) examined in this study, the overall mean for absences was less than 4 class periods per 32 class period semester. The homework averages ranged from zero, for those students who withdrew early in the semester, to an overall class average of 86%, a passing grade of B. Less than 20% of students received tutoring from the school, possibly due to some receiving help from outside of school resources that were not recorded, or possibly due to a lack of need (perceived or real) for tutoring.

An examination was performed of the beliefs and the behaviors and the correlation of the interaction between them to see if any significant results could be observed (see Table 4.14).

Table 4.14

Correlations for Subcategories of Beliefs and Behaviors

Subcategories		Absences	Homework Average	Tutoring Hours
Behaviors				
Absences	Pearson Correlation		-.089	-.035
	Sig. (2-tailed)		.363	.721
Homework Average	Pearson Correlation	-.089		.090
	Sig. (2-tailed)	.363		.356
Tutoring Hours	Pearson Correlation	-.035	.090	
	Sig. (2-tailed)	.721	.356	
Beliefs				
Class Devaluation	Pearson Correlation	.205*	.093	-.104
	Sig. (2-tailed)	.034	.340	.286
No Future Value	Pearson Correlation	.038	.107	.027
	Sig. (2-tailed)	.694	.274	.786
Math Confidence	Pearson Correlation	.059	.159	-.128
	Sig. (2-tailed)	.544	.102	.189
Discouraging Words	Pearson Correlation	-.047	-.002	-.026
	Sig. (2-tailed)	.629	.985	.790
Math Anxiety	Pearson Correlation	-.099	-.078	.184
	Sig. (2-tailed)	.311	.424	.058

N = 107 * Significant at $p<.05$

Correlation between class devaluation and the number of absences was found to be significant at ($p < .05$). With the belief that class was of little value, the number of absences increased. No other significant Pearson values were found.

Relationships between beliefs and behaviors were observed. Positive correlation between math value and absences existed. The lower the value belief was, the higher the absence rate was. A negative correlation between math barriers and absences seems to indicate that the more math anxiety and learned negative beliefs about math a student brings to class, the greater the number of absences. Lack of math confidence was negatively related to more hours in tutoring sessions. The stronger the belief in the barriers, anxiety and discouraging words were, the lower homework grades were. Survey questions dealing with math barriers (subcategory discouraging words) were as follows: My parents have told me that I am bad at math; My teachers have told me that I am bad at math; and My friends have told me that I am bad at math. Overall, the stronger the negative beliefs, the weaker the behaviors, or possibly the converse: the weaker the behaviors belief, the stronger the barrier beliefs.

Demographics

The third question posed by this study was which demographics are associated with the performance of women in college algebra. After examining the demographic categories of the women in this study, correlations were performed between each demographic characteristic and the performance in the class as designated by Pass/Not Pass and are described in Table 4.15.

Table 4.15

Demographic Characteristics and Performance Correlations

Demographics		Pass/Not Pass
Ethnicity	Pearson Correlation	-0.054
	Sig. (2-tailed)	0.579
Age	Pearson Correlation	0.057
	Sig. (2-tailed)	0.559
Semester in College Classification	Pearson Correlation	-0.066
	Sig. (2-tailed)	0.500
Hours Worked	Pearson Correlation	0.005
	Sig. (2-tailed)	0.958
Number of Children	Pearson Correlation	0.129
	Sig. (2-tailed)	0.184
Area of Study	Pearson Correlation	-0.059
	Sig. (2-tailed)	0.544
Miles from Campus	Pearson Correlation	0.091
	Sig. (2-tailed)	0.353
Marital Status	Pearson Correlation	-0.059
	Sig. (2-tailed)	0.549

(N = 107)

Upon finding no significant correlation between each demographic characteristic and performance in the course, correlations were run between the five subcategories of beliefs: class devaluation, no future value, confidence, math anxiety, and discouraging words with the demographic characteristics. The findings of these correlation tests are described in Table 4.16.

Table 4.16

Correlation between Beliefs and Demographics

Beliefs	Ethnicity Recoded	Age	Semester Classification	Hours of Work	Number of Children	Miles from Campus	Marital Status	Area of Study	Pass/Not Pass
Math Value	.014	.264**	-.237*	.038	-.005	-.008	.150	.031	.122
Class Devaluation	.093	.185	-.215*	.123	-.023	-.087	.192*	-.022	.088
No Future Value	-.137	.249**	-.134	-.140	.030	.141	-.017	.109	.109
Math Confidence	.099	-.022	-.192*	.028	.086	-.093	.077	-.148	.134
Math Barriers	-.225*	.059	.170	-.107	.038	.158	-.070	.008	-.120
Discouraging Words	-.141	.089	.176	-.022	-.058	.106	.041	-.069	-.037
Math Anxiety	-.223*	.041	.145	-.122	.066	.155	-.099	.034	-.132
Pass/Not Pass	-.054	.057	-.066	.005	.129	.091	-.059	-.059	

*Significant at p<.05 ** Significant at p<.01

A negative correlation between ethnicity and math barriers of -0.255 was found to be significant (p<.05) and a negative correlation of -0.223 was found between ethnicity and the subcategory of barriers, math anxiety, significant at the p<.05 level. Originally six categories of ethnicity: American Indian or Alaskan native; Hispanic or Latino; Black or African American; White or Caucasian, not of Hispanic origin; Asian or Pacific Islander; and Other were used on the survey. Since the majority of participants in the study were Hispanic, the ethnicities were divided into two categories: Hispanic and non-Hispanic (see Table 4.17).

Table 4.17

Math Anxiety and Ethnicity

Ethnicity	Number of Students	Mean	Standard Deviation	Standard Error Mean
Non-Hispanic	26	27.65	9.260	1.816
Hispanic	81	22.90	8.886	.987

An independent-samples t-test was conducted to compare math anxiety scores between Hispanics ($M = 22.9$, $SD = 8.886$) and Non-Hispanics ($M = 27.65$, $SD = 9.26$). There was a statistically significant difference, $t\ (105) = 2.349$, $p < .05$. The t-test for ethnicity and math anxiety showed a significant difference of $p = 0.021$ and a difference in the two ethnic groups exists when math anxiety is considered. Levene's test for equality of variances showed that the variance for Hispanics and non-Hispanics are roughly equal, $p = .964$.

Survey questions dealing with math barriers (subcategory math anxiety) were as follows: I have trouble remembering the steps in solving math problems; When I am taking a math exam, I feel tense and have trouble breathing; When I do math problems, I feel frustrated and angry; When I do math problems, I feel stupid; When I get confuse about something in math, I feel embarrassed; When I am taking a math exam, I forget everything that I have practiced; and I cannot concentrate on math for more than short periods of time.

A positive correlation between age and math value (0.264) and positive correlation between age and the subcategory of no future value (0.249) were found to be significant at the $p<.01$ level. Table 4.18 shows the descriptive means for the two age groups of 18-25 years of age and older than 25 years.

Table 4.18

Math Value and Age

Age	Number of Students	Mean	Standard Deviation	Standard Error Mean
Over 25	15	19.40	6.759	1.745
18-25	92	25.10	7.359	.767

An independent-samples t-test was conducted to compare math value and age. There was a statistically significant difference, $t\ (105) = -2.81$, $p < .01$. Ninety-two out of the 107 women were under the age of 25 years and showed a lower math value mean of 19.4 in comparison to those students over 25 years of age who showed a mean of 25.10. Levene's test for the equality of variances $t\ (105) = -2.81$, $p = .654$ showed that the variances were roughly equal. Students over 18 years of age showed higher no future value scores, putting less emphasis on the need for math in their future.

Math value questions from the no future value subcategory were as follows:

2) Being good at math will help me in my future professional life (recoded response 1 = 5, etc.)
5) Getting a bad grade in math will not seriously affect my future employment possibilities
6) Getting a bad grade in math will not seriously affect my future financial well-being
7) Getting a bad grade in math will not seriously affect the completion of my college degree

Survey questions dealing with math value (subcategory class devaluation) were as follows:

1) I can learn the math material without coming to class

3) I can get a good grade in math even if I skip classes

4) I can get a good grade in math even if I skip the assigned homework

8) If I miss math classes, I can always learn it on my own from the textbook

9) If I miss math classes, I can always catch up later

10) If I skip homework assignments, I can always catch up later

More significant correlations were found between classification of the semester of study in college with math value (-0.237), math confidence (-0.192) and the subcategory, class devaluation (-0.215), all significant at the $p<.05$ level, as shown in Table 4.19.

Table 4.19

Correlation of Semester in College Classification, Math Value, Math Confidence and Math Barriers

Beliefs	Semester Classification	N	Mean	Std. Deviation	Std. Error Mean
Math Value	first semester	34	26.88	7.057	1.210
	third semester	30	23.13	8.245	1.505
Math Confidence	first semester	34	29.79	5.493	.942
	third semester	30	24.37	7.509	1.371
Math Barrier	first semester	34	24.91	8.864	1.520
	third semester	30	32.90	11.917	2.176

Since the two classification levels of first- and third-semester showed close results in the categories of value and confidence and math barriers (subcategory of class devaluation), an independent t-test was performed to see if there was a significant correlation. From the independent-samples t-test comparing math values, math confidence, and math barriers with classification, scores for math value (subcategory of class devaluation) sum and classification first semester ($M = 26.88$, $SD = 7.057$) and for third semester ($M = 23.13$, $SD = 8.245$) (see Table 4.17). Levene's test for Equality of Variances $t(62) = 1.960$, $p = .318$ showed that the variance was roughly equal for math value; $t(62) = 3.326$, $p = .022$ for math confidence; and

$t(62) = -3.065$, $p = .013$ for math barrier. As the time in college increased, the math value and class devaluation beliefs, both negatively correlated to classification, showed a change to a positive attitude toward math value, while the time in college increased the confidence level decreased.

Survey questions dealing with math value (subcategory class devaluation) were as follows:

1) I can learn the math material without coming to class

3) I can get a good grade in math even if I skip classes

4) I can get a good grade in math even if I skip the assigned homework

8) If I miss math classes, I can always learn it on my own from the textbook

9) If I miss math classes, I can always catch up later

10) If I skip homework assignments, I can always catch up later

Survey questions dealing with math confidence were as follows:

11) I am confident that I can get a passing grade in math

12) I am confident that I can get an A in math

13) If I miss a math class, I am confident that I can make up the work

14) Even if I do not understand a math problem at first, I am confident I will get it eventually

15) Math seems easy for me and I am confident I will get a good grade in this math class

16) If I get a bad grade on a math test, I know I can do better next time with more practice

17) I am confident I can practice math problems by myself until I understand them

Math value did not show a significant correlation with marital status, but the subcategory of class devaluation did show a significant correlation with marital status, married/not married, $r = .192$, $p < .05$.

An independent-samples t-test was conducted to compare math value, subcategory of class devaluation between married ($M = 12.10$, $SD = 4.508$) and not married ($M = 15.90$, $SD = 6.209$). Levene's test for equality of variances showed that the variance for married and not married are roughly equal, $p = .111$. Not married individuals showed higher class devaluation values.

Table 4.20

Math Value and Marital Status

Beliefs	Marital status Recoded	N	Mean	Std. Deviation	Std. Error Mean
Math Value	married	10	21.00	6.976	2.206
	not married	97	24.64	7.520	.764
Class Devaluation	married	10	12.10	4.508	1.426
	not married	97	15.90	6.209	.630
No Future Value	married	10	8.90	4.999	1.581
	not married	97	8.74	3.232	.328

Only one significant difference was found among the math beliefs, math behaviors, math barriers, and performance in college algebra and that was performance and homework. Nevertheless, significant correlations were found among math value and math confidence and math anxiety. Math value was correlated with the demographics of age and semester classification and with the math behavior of attendance/absences. Math confidence was correlated with math barriers. The math barrier of math anxiety was correlated with ethnicity.

Chapter V

Conclusion

This chapter presents the conclusions and recommendations from the study. The chapter is divided into the following sections: (1) Summary of the Study, (2) Results, (3) Discussion, (4) Implications, (5) Limitations and Delimitations, and (6) Suggestions for Future Research.

Summary of Results

The initial population for this study consisted of all students enrolled in college algebra during the fall semester of 2015 in a rural South Texas community college. All students 18 years of age and older enrolled in college algebra during the fall 2015 semester were invited by e-mail (see Appendix B) and by a face-to-face introduction of the study and invitation to participate. Students in online classes were invited to participate through an e-mail introduction and invitation to participate. Of the 475 students enrolled in college algebra during fall 2015, 187 eligible students consented to participate and completed the survey. Data was collected, and only the 126 female participants' data was analyzed for this study.

The adjusted sample (N = 107) included only female respondents who completed the survey with correct identifiable student ID, allowing the correlation of final course grade and responses to survey. The student ID was used only to connect survey responses with final grade, homework, tutoring hours, and attendance. At no time was the identity of the student revealed or used in this study.

The purpose of this study was to recognize and describe the beliefs and behaviors of women successful in college algebra and to determine the demographics associated with performance in college algebra.

Results

Research Question One: What is the relationship of the three math beliefs (math value, math confidence, math barriers) to the performance of women in college algebra?

No significant correlation between any of the three math beliefs and the Pass/Not Pass performance of women in college algebra was observed.

A positive correlation between age and math value $r = 0.264$ was found to be significant at the $p < .01$ level. Ninety-two out of the 107 women were under the age of 25 years, possibly indicating that the correlation between age and no future value of math belief may stem from the lack of experience younger women have, from the lack of realization of the value math may have on future jobs, success, and completion of degree, or possibly from discouraging the use and practical value of math in some fields.

Significant correlations were found between classification of student by the semester of study in college with math value $r = -0.237$, math confidence $r = -0.192$ all significant at the $p < .05$ level. The two classification levels of first- and third-semester in college showed close results in the categories of value and confidence. Scores for the math value and classification first semester ($M = 17.74$, $SD = 6.321$) and for third semester ($M = 14.5$, $SD = 5.612$). As the time in college increased, the math value beliefs, negatively correlated to classification, showed a positive value change. Realization by students that college demands were more rigorous may be a reason why the value change existed.

Correlation between math confidence and semester in college classification was found to be inversely correlated $r = -.192$. There was a statistically significant difference, $t(62) = 3.326$, $p < .001$. Increase in semesters in college did not show increase in math confidence, possibly due to the increased rigor in upper level courses or maturity level of students and a truer look at their abilities as time in college progressed

A negative correlation between ethnicity and math barriers of $r = -0.255$ was found to be significant ($p<.05$). The correlation between ethnicity, in Hispanic and non-Hispanic categories, and math barriers showed that the non-Hispanic were more anxious about math. This might be due to the high confidence level of students coming out of high school or may be the lack of experience of dealing with anxiety.

Research Question Two: What is the relationship of the three behaviors: class attendance, homework, and use of tutoring to the performance of women in college algebra?

The only behavior found to be significant with performance was the homework. A positive correlation between the pass/not pass performance and the math behavior of doing homework, $r = .707$, was highly significant at the $p < .01$ level. The more homework completed, which meant more practice of math skills, showed to be a benefit to performance to the students in this study. Hendy et al. (2014) stated that students with higher class devaluation scores and lower math confidence scores exhibited less of the behaviors of attending class, doing homework, and using tutoring. Higher math anxiety scores also showed less attending class and lower final grades. Since the behaviors were self-reported in the Hendy study, and there were no teacher ratings available, correlations were not presented in that study.

Research Question Three: Which demographics are associated with the performance of women in college algebra?

There was no significant correlation between the demographics of the women in this study and performance, pass/no pass. There were significant differences between the demographics and beliefs.

Ethnicity and math barriers were significantly correlated, $r = -.225$, $p < .05$. Ethnicity and the subcategory, math anxiety, were significantly correlated, $r = -.233$, $p < .05$. The scores for Hispanic were ($M = 22.90$, $SD = 8.886$) and for non-Hispanic ($M = 27.65$, $SD = 9.260$). The non-Hispanic group of students showed more anxiety when taking the college algebra course, possibly due to lack of experience in dealing with anxiety, past performance, failure, cultural expectations, or for lack of interventions that might help students deal with anxiety.

Age and math value beliefs were significantly correlated, $r = .264$, $p < .01$. Scores for the math value and age for students 18-25 years of age were ($M = 25.10$, $SD = 7.359$) and for students over 25 years of age ($M = 19.40$, $SD = 6.759$). The subcategory of math beliefs, no future value contributed to the scores by being significant to age, $r = .249$, $p < .01$.
The younger students holding the belief that math held no value in obtaining their degrees and in their future jobs, possibly due to the high confidence values they held and the lack of experience in holding and maintaining a job and family.

The semester of classification of the student showed significant correlation with math value, $r = -.237$, $p < .05$. First semester students and math value scores were ($M = 26.88$, $SD = 7.057$). Third semester students and math value scores were ($M = 23.13$, $SD = 8.245$). The negative correlation between first semester and math value showed that the first semester students showed higher math value. First semester students may become aware that college is more rigorous and more demanding and that support staff emphasize the need for math in degree plans and career plans and find math of value.

Semester in college and math confidence showed significant correlation, $r = -.192$, $p<.05$. Scores for first semester students and math confidence were ($M = 29.79$, $SD = 5.439$) and for third semester students and math confidence and math confidence were ($M = 24.37$, $SD = 7.509$). Scores for third semester students and math confidence were $r = -.192$, $p < .05$, ($M = 24.37$, $SD = 7.509$). Lack of experience in the use of math in jobs and family maintenance may result in the first semester students not being confident in their skills. The dependence on calculators and computers to do math in early studies and the increase in rigor and problem solving in college algebra may also add to the difference in confidence between first semester and third semester students. First semester students were making adjustments to the new college requirements and were not as confident in this new situation.

Marital status and the math belief subcategory, class devaluation was significantly correlated, $r = .192$, $p < .05$. The scores for married group and class devaluation were ($M = 12.10$, $SD = 4.508$) and the scores for the unmarried group and class devaluation were ($M = 15.90$, $SD = 6.209$). The unmarried group agreed with the survey questions that described the lack of need to attend class and the usefulness of class behaviors. This may be due to the lack of experience in prioritizing events, time management, and responsibilities within married life.

Discussion

According to Hendy et al. (2014), understanding a broad range of math beliefs that college students possess that are associated with the recommended behaviors necessary for the success in college is necessary for the faculty, staff and administration in planning the interventions that support college work. Colleges and universities are supplying free tutoring, individualized advising, supplemental instruction, calculators, computers, and other electronic support devices. They are supplying a wide variety of instructional modes, face-to-face, online, and distance learning that gives students the opportunity to attend class wherever they are. Labs, hands-on work, project based instruction, group projects, and many more learning forms are available to many students and studies show their benefits. The question Hendy et al. (2014) posed and that this study examined is that if all these interventions are useful and available or can be made available, why are students not using them or benefiting from them when it comes to success in college math courses, particularly college algebra, the gate-keeper course to degrees for many students? Hendy (2015) provided a guide for the use of the three measures of math beliefs so that college educators would have an effective tool to help students with behaviors to ensure better performance in mathematics classrooms. (see Appendix D)

Wigfield & Eccles (1992) suggested in their expectancy-value theory, which was used by Hendy et al. (2014) in developing their survey, some students may not believe that the recommended behaviors of attending class, doing homework, and using tutoring opportunities provided for them were of any value to their future careers and their attainment of a college degree. Hendy et al. (2014) found a strong correlation between student and teacher ratings of class attendance, but had no other available information to calculate correlations for homework and tutoring. This study collected teacher-reported attendance, homework grades and number of hours of tutoring for each student in college algebra for fall 2015 and observed a strong correlation between performance and homework. This study suspected but did not observe any strong correlations between class attendance and tutoring with performance. This could be the result of interventions provided for the students, for example: recorded lessons, computerized lab sessions conducted by instructors aiding students in homework, and study skills and time management lessons imbedded within math classes.

Another contributing factor that the Hendy et al. (2014) study found was that the math value belief had several contributing subcategories of class devaluation, no future value, math confidence, discouraging words, and math anxiety. The greater the class devaluation belief the fewer recommended behaviors of attendance, homework, and tutoring were exhibited. This study found significant correlations between class devaluation and attendance/ absences. This correlation may have stemmed from the use of provided interventions used to build beliefs in behaviors necessary for success in math or lack of experiences in life situations where attendance is not seen as a benefit.

The lower the math confidence score was, the less exhibition of the three behaviors of attendance, homework, and tutoring (Hendy et al., 2014). The present study showed no significant correlations among the math confidence belief and the three behaviors. This study did show significant positive correlations between math confidence and math value. The more confident a student was in her mathematical skills and performance, the more she valued math and its reciprocal, which might have then supported the significant correlation between math value and attendance. Students seeing no value in math became more anxious and discouraged; or the reciprocal effect became apparent: the more anxious towards math and the more discouraging words heard about math, the less the student valued study in math.

The Hendy et al. study (2014) showed that students with more math anxiety exhibited less class attendance and lower performance grades. The present study showed no significant correlations between math anxiety and attendance, and math anxiety and performance, but did show significant negative correlations between math confidence and math barriers, with both subcategories discouraging words and math anxiety showing significant negative correlations with math confidence. Math anxiety, and possibly the learned belief of lack of math ability from discouraging words of family, peers, and teachers, lowered the math confidence of the student. Bandura's self-efficacy theory (1983) suggested that even though students may possess the beliefs in the benefits of behaviors toward their goals, the lack of confidence that they can perform these behaviors keeps them from exhibiting the behaviors. Hendy et al. (2014) suggested that perceived value of behaviors and perceived confidence in performing the behaviors may prevent students fail to perform the behaviors.

Although the beliefs did not show a significant effect on grade performance in this study, the correlations between the beliefs and attitudes of the students were significant, which previous studies by Geist (2010) and Blazer (2011) suggested, should have an effect on performance. The pass rate for this study was 85%. The size of the college and the culture that exists with the interventions supporting the women in college algebra may have had an effect on the study that would not show significant correlations among the beliefs and performance.

To summarize the behaviors (attendance, tutoring, and homework) examined in this study, the overall mean for absences was less than 4 class periods per 32 class period semester. The homework averages ranged from zero, for those students who withdrew early in the semester, to an overall class average of 86%, a passing grade of B. Less than 20% of students received tutoring from the school, possibly due to some receiving help from outside of school resources that were not recorded, or possibly due to a lack of need (perceived or real) for tutoring. Data seemed to indicate a lack of need for help in the course or the high confidence in self-help out-weighed the need for outside help. In identifying the behaviors of students in college algebra, teachers and administrators at the colleges and universities are being given more information on the needs of the students and their success.

Implications

In identifying and describing the demographic characteristics of women in college algebra and their beliefs and behaviors in mathematics, instructors, support staff, and administration can focus on the needs of women and channel resources where they are most beneficial. In identifying the math beliefs, math behaviors, and math barriers of the women successful in college algebra and the correlations that have effects upon performance and course completion, interventions may be made available to suit the needs of students (Ross-Gordon, 2011). In turn, successful degree completion and career performance in STEM fields may be a result.

At a time when jobs that require little education are disappearing, many women are needed in the STEM fields. In identifying their math beliefs and supporting the performance of their math behaviors, math anxiety and math barriers may be minimized and coped with by women while attending college and completing their degrees.

Efforts are being made in Texas to achieve Goal 2025, proposed by the Lumina Foundation boosting college attainment, and proposing that 60% of Americans obtain a postsecondary degree or credential by 2025 (Erisman & Steele, 2015). A priority concern, not only for college and universities, but also for counselors, instructors, curriculum experts, and textbook and software companies, is how to improve the success rates of women in mathematics.

The merit of this study is its contribution to the limited existing knowledge of placing, aiding, and instructing women in mathematics courses with support, interventions, brain and ability training, and alternative scheduling needed for success. Identification of methodologies to be used within the classroom, active learning group projects, cooperative learning groups, and undergraduate research projects which enhance women's learning styles need to be a focus in the classroom. Further, this study attempted to provide a composite profile of successful women in college algebra and potentially all college mathematics. Student success is a function of institutional commitment (Horn & Carroll, 2006).

Limitations and Delimitations

In looking back at the results of the survey, there is the need to rephrase responses to the question asking for the number of children being cared for in the household. The response of 0-2 children needs to be separated into two responses: 0 children and 1-2 children, since there may be significance between having to care for children and not having to care for children.

Suggestions for Future Research

Suggestions for future studies would be to attain a larger population sample from rural and urban colleges with comparative South Texas demographics to see if size of the institution and attention given to students, student-teacher ratios, makes a difference. Similarly, comparative populations from larger colleges and/or universities should be surveyed to see if the difference in maturity and the age of women students affects performance in math. To examine the correlation between the length of time in college, the semester of study, whether beginning college career or more experienced third, fourth, or graduate level semesters, makes a difference in confidence.

Another very important feature that needs to be examined in determining success in college algebra are the interventions being used by the institutions and feedback from students by self-reported discussions of need for specific interventions and usefulness of types of interventions being used to support and build the math beliefs and behaviors, while minimizing math barriers. Instructor feedback and documentation of success rates of students correlated with specific interventions, for example tutoring, advising, and supplemental instruction used, would also be of benefit in the research. Future studies might incorporate the study of men and women within the mathematics classroom, mixed sex classes and single sex classes.

Supporting and building of confidence in students, especially women, should be a focus in math classes, using people in the field and past graduates to show the value of math in the future and the usefulness in the work environment. Undergraduate research using various forms of math, curriculum with more active learning, and project-based instruction would not only build confidence, but would also support interest and understanding of the usefulness of mathematics in the educational field as well as the job-related arena for women. Supporting and encouraging female teachers to serve as role models for their students, showing value and building cultural expectations of women in math careers would be most valuable.

References

Abosede, S.C. (2015). Gender, parents' job-type and family size as determinants of junior secondary school students' academic performance. *International Journal of Humanities and Social Science, 5*(4), 75-81. Retrieved from http://www.ijhssnet.com/journals/Vol_5_No_4_April_2015/8.pdf

Abubakar, R.B., & Oguguo, O.D. (2011, September). *Age and gender as predictors of academic achievement of college mathematics and science students*. Paper presented at the International Conference on Teaching and Learning, African Association for Teaching and Learning, Federal College of Education (Technical). Omuku, Rivers State, Nigeria. Retrieved from http://www.hrmars.com/admin/pics/186.pdf

ACT National Career Readiness. (2013). *Cognitive and noncognitive skills*. Retrieved from http: www.act.org/workforce

Andreescu, T., Gallian, J.A., Kane, J.M., & Mertz, J.E. (2008). Cross-cultural analysis of students with exceptional talent in mathematical problem solving. *Notices of the American Mathematical Society (AMS), 55*(10), 1248-1260.

Arendale, D.R. (2000). *History of supplemental instruction (SI): Mainstreaming of developmental education*. Retrieved from www.tc.umn.edu/~arend011/SIhistory02.pdf

Askew, M., Hodgen, J., Hossain, S., & Bretscher, N. (2010). *Values and variables: Mathematics education in high-performing countries.* A commissioned review. Kings College, London: Nuffield Foundation. Retrieved from www.nuffieldfoundation.org

Atchley, T.W., Wingenbach, G., & Akers, C. (2013). Comparison of course completion and student performances through online and traditional courses. *The International Review of Research in Open and Distance Learning, 14*(4), 104-116. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1461/2685

Averill, J.R. (1973). Personal control over aversive stimuli and its relationship to stress. *Psychological Bulletin*, *80*, 286-303.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 12-147.

Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamities. *Journal of Personality and Social Psychology, 45*(2), 464-469.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*, 248-287.

Berns, R.G., & Erickson, P.M. (2001). *Contextual teaching and learning: Preparing students for the new economy.* Bowling Green, KY: Bowling Green State University. Retrieved from http://www.bgsu.edu/ctl

Blazer, C.B. (2011). Strategies for reducing math anxiety. *Information Capsule Research Services, 1102.* Miami, FL: Dade Schools Office of Assessment, Research and Data Analysis. Retrieved from http://drs.dadeschools.net

Bohner, G., & Wanke, M. (2002). *Attitudes and attitude change*. New York, NY: Psychology Press.

Briner, M. (1999). *United Nations educational, scientific and cultural organization*. Retrieved from http:// portal.unesco.org/education/en/ev.php

Carnevale, A., Smith, N., & Strohl, J. (2010). *Projections of jobs & education requirements through 2018*. Washington, D.C.: Center on Education and the Workforce, Georgetown University. Retrieved from http://cew.georgetown.edu/recovery2020

Carnevale, A., Smith, N., & Strohl, J. (2013). *Recovery: Job growth and education requirements through 2020*. Washington, D.C.: Center on Education and the Workforce, Georgetown University.

Ceci, S.J., & Williams, W.M. (2010a). *The mathematics of sex: how biology and society conspire to limit talented women and girls*. New York, NY: Oxford University Press.

Ceci, S.J., & Williams, W.M. (2010b). Sex differences in math-intensive fields. *Current Directions in Psychological Science*, *19*(5), 275-279.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). New York, NY: Routledge.

Colton, M. J., Sanders, R., & Williams, M. (2001). *An introduction to working with children: A guide for social workers.* Houndmills, Basingstoke, Hampshire: Palgrave.

Complete College America. (April 2013). *Complete College Texas: Texas gets it*. Indianapolis, IN: Complete College America. Retrieved from www.completecollege.org/docs/CCT-low-res.pdf

Creswell, J. W., & Clark, V.L.P. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage Publications.

Curiel, N. (2010). *An exploratory study of nonacademic factors predictive of college algebra achievement among community college and university students*. (Doctoral dissertation). Texas A&M Corpus Christi, Corpus Christi, TX.

Curry, L. (1990*). Learning styles in secondary schools: A review of instruments and implications for their use.* Madison WI: Wisconsin Center for Education Research (ERIC Document Reproduction Service No. ED 317283)

Dewey, J. (1910). *How we think*. New York: D.C. Heath and Co. Retrieved from https://archive.org/details/howwethink000838mbp

Duke, E.U., Mgbekem, M.A., Nsemo, A.D., Ojong-Alacia, M.M., Nkwonta Chigozie, A., & Mobolaji-Olajide, O.M. (2015). Influence of marital status on attitude of midwives towards OSCE and their performance in the examination in Akwa Iborn and Cross River States, Nigeria. *Journal of Education and Training Studies, 3*(4), 119-126. doi: 10.11114/jets.v3i4.812 Retrieved from http://dx.doi.org/10.11114/jets.v3i4.812

Duran, M. (2010). *Distance learning plan: The distance learning department handbook.* Beeville, TX: Coastal Bend College.

Dweck, C.C. (2006). *Mindset, the new psychology of success*. New York: Ballantine Books.

Eisenberg, N., Martin, C.L., & Fabes, R.A. (1996). Gender development and gender effects. In D.C. Berliner & R.C. Calfee (Eds.), *Handbook of Educational Psychology*. New York: Simon & Schuster Macmillan.

Ely, E.E. (1997). *The non-traditional student*. Paper presented at the American Association of Community Colleges Annual Conference. Anaheim, CA. April12-15, 1997. (ERIC Document Reproduction Service No. ED 411906)

Erisman, W., & Steele, P. (2015). Adult college completion in the 21st century: What we know and what we don't. *Higher Ed Insight*. Washington, D.C.: Lumina Foundation. Retrieved from www.higheredinsight.com

Feather, N. T. (1988). Values, valences, and course enrollment: Testing the role of personal values within an expectancy-valence framework. *Journal of Educational Psychology*, *80*, 381-391.

Fennema, E., & Peterson, P.L. (1985). Autonomous learning behavior: A possible explanation of gender-related differences in mathematics. *Educational Studies in Mathematics, 16*(3), 309-311.

Fennema, E., & Sherman, J. (1976). Fennema-Sherman mathematics attitudes scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males. *Journal for Research in Mathematics Education*, *7*(5), 324-6.

Field, A. (2009). *Discovering statistics using SPSS®* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Fiske, S.T., & Taylor, S.E. (1991). *Social cognition* (2nd ed.). New York, NY: McGraw-Hill.

Fouad, N. (2008, September). Tracking the reasons many girls avoid science and math. *Science Daily*. Retrieved from www.sciencedaily.com/releases/2008/09/08095153870.htm

Fraser, B.J., & Kahle, J. B. (2007). Classroom, home and peer environment influences on student outcomes in science and mathematics: An analysis of systemic reform data. *International Journal of Science Education, 29*(15), 1809-1909.

Frome, P., & Eccles, S. (1998). Parents' influence on children's achievement-related perceptions. *Journal of Personality and Social Psychology*, *74*(2), 435-452.

Gall, M.D., Gall, J.P., & Borg, W.R. (2007). *Educational research: An introduction* (8th ed.). Boston, MA: Pearson.

Gardner, H. (1997). *Extraordinary minds.* New York: Basic Books.

Gavin, M. K. (1996). *What educators need to know about encouraging talented girls in mathematics.* Retrieved from http://www.gifted.uconn.edu/nrcgt/reports/trifolds/a0022p.pdf

Geist, E. (2010). The anti-anxiety curriculum: Combating math anxiety in the classroom. *Journal of Instructional Psychology, 37*(1). Retrieved from http://www.faqs.org/periodicals/201003/2011820081.html

Ginder, S.A., & Kelly-Reid, J. E. (2013). *Enrollment in postsecondary institutions, fall 2012*; *financial statistics, fiscal year 2012; graduation rates, selected cohorts, 2004-09; and employees in postsecondary institutions, fall 2012. First look (Provisional data)* (NCES 2013-183). U.S. Department of Education. Washington, D.C.: National Center for Education Statistics. Retrieved from http://nces.ed.gov/pubsearch

Goldstein, L.S. (1999). The relational zone: The role of caring relationships in the co-construction of mind. *American Educational Research Journal, 36*(3), 647-73.

Gordon, S. P. (2005). What's wrong with college algebra? *United University Professions Working Paper Series*. WPS 2005-M-002. Retrieved from http://uupinfo.org/research/working/gordon.pdf

Gottlieb, G. (1995). Normally occurring environmental and behavioral influences on gene activity: From central dogma to probabilistic epigenesis. *Psychological Review*, *105*(4), 792-802.

Halpern, D.F., Aronson, J., Reimer, N., Simpkins, S., Star, J.R., & Wentzel, K. (2007). *Encouraging girls in math and science*. (NCER 2007-2003). Washington, D.C.: National Center for Education Research, Institute of Education Services, U.S. Department of Education. Retrieved from http://ncer.ed.gov

Hendy, H.M. (2015). *Three measurements of math beliefs in college students – A guide for use.* Haven, PA: Pennsylvania State University, Schuykill Campus.

Hendy, H.M., Schorschinsky, N., & Wade, B. (2014). *Measurement of math beliefs and their associations with math behaviors in college students*. (1040-3590). Washington, D.C.: American Psychological Association.
Retrieved from http://dx.doi.org/10.1037/a0037688

Horn, L., & Carroll, C.D. (2006). Placing college graduation rates in context: How 4-year college graduation rates vary with selectivity and the size of low-income enrollment. *Postsecondary Education Descriptive Analysis Report*. (NCES 2007-161). Washington, D.C.: National Center for Education Statistics, U.S. Department of Education.

Hosmer, D.W., & Lemeshow, S. (2000). *Applied Logistic Regression* (2nd ed.). New York, NY: John Wiley & Sons, Inc.

House, J.D. (2003). Self-beliefs and science and mathematics achievement of adolescent students in Hong Kong: Findings from the third international mathematics and science study (TIMSS). I*nternational Journal of Instructional Media*, *30*, 195-212.

IBM Corporation. (Released 2014). *IBM SPSS® statistics for Windows*, Version 23.0. Armonk, NY: IBM Corp.

Janz, N.K., & Becker, M.H. (1984). The health belief model: A decade later. *Health Education Quarterly*, *11*, 1-47. doi: 10.1177/109019818401100101

Jennison, M. & Beswick, K. (2010). *Student attitude, student understanding and mathematics anxiety*. (ERIC Document Reproduction Service No. ED 520908) Retrieved from http://files.eric.ed.gov/fulltext/ED520908.pdf

Josiah, O., & Etuk-iren, O.A. (2014). Effect of gender, age and mathematics anxiety on college students' achievement in algebra. *American Journal of Educational Research, 2*(7), 474-476. Retrieved from http://pubs.sciepub.com/education/2/7/7/

Kane, J.M., & Mertz, J.E. (2012). Debunking myths about gender and mathematics performance. *Notices of the American Mathematical Society (AMS), 59*(1). Retrieved from http://www.ams.org/notices/201201/rtx120100010p.pdf

Kenney-Wallace, P.M. (2013). *An analysis of the relationship between emotional intelligence, constructive thinking, and student achievement in developmental mathematics*. (Doctoral dissertation). Texas A&M University-Kingsville, Kingsville TX and Texas A&M University-Corpus Christi, Corpus Christi TX.

Kivilu, J. M., & Rogers, W.T. (1998). A multi-level analysis of cultural experience and gender influences on causal attributions to perceived performance in mathematics. *British Journal of Educational Psychology*, *68*, 25-37.

Kuh, G.D., Kinzie, J., Buckley, J.A., Bridges, B.K., & Hayek, J.C. (2006). *What matters to student success: A review of the literature.* A commissioned report for the National Symposium on Postsecondary Student Success: Spearheading a Dialog on Student Success. Symposium conducted in Washington, D.C., November 1-3, 2006, by the National Postsecondary Education Cooperative. Retrieved from https://nces.ed.gov/npec/pdf/Kuh_Team_Report.pdf

Leder, G.C. (1992). Mathematics and gender: Changing perspectives. In D.A. Grouws (Ed.), *Handbook of Research on Mathematics Teaching and Learning.* New York, NY: Macmillan.

Levi, L. (2000). Gender equity in mathematics education. *Teaching Children Mathematics, 7*(2), 101-105.

Lotkowski, V.A., Robbins, S.B., & Noeth, RJ. (2004). The role of academic and non-academic factors in improving college retention. *ACT Policy Report.* Retrieved from www.act.org/research/policy/index.html

Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education, 30*(5), 520-40. Retrieved from http://www.jstor.org/stable/749772

Maloney, E.A., Ramirez, G., Gunderson, E.A., Levine, S.C., & Beilock, S.L. (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychological Science, 26*(9), 1480-1488. Retrieved from http://www.sciencedaily.com/releases/2015/08/150810091859.htm

McLeod, D.B. (1992). Research on affect in mathematics education: A reconceptualization. In D.A. Grouws (Ed.), *Handbook of Research on Mathematics Teaching and Learning*. New York, NY: Macmillan.

McMillan, J.H., & Forsyth, D.R. (1981). The impact of social psychological factors on school learning: An overview. *Representative Research in Social Psychology*, *12*, 20-3.

Meece, J. L., Wigfield, A., & Eccles, J.S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment intentions and performance in mathematics. *Journal of Educational Psychology, 82* (1)*,* 60-70.

Miller, S.M. (1979). Controllability and human stress: Method, evidence and theory. *Behaviour Research and Therapy, 17*, 287-304.

Mohamed, L., & Waheed, H. (2011). Secondary students' attitude towards mathematics in a selected school of Maldives. *International Journal of Humanities and Social Science, 1*(15), 277-281. Retrieved from http://www.ijhssnet.com/journals/Vol_1_No_15_Special_Issue_October_2011/34.pdf

Muijs, D. (2004). *Doing quantitative research in education*: *With SPSS®.* London, UK: Sage Publications.

Murdock, S. (November, 2014.) *Demographer paints grim picture*. Texas Community College Teachers Association blog. Retrieved fromhttp://www.tccta.typepad.com/

National Center for Education Statistics (2013). *Center community college research*. Washington, DC: Georgetown University Center on Education and the Workforce.

National Center for Education Statistics (2014a). *Projections of education statistics to 2020*. Washington, DC: Georgetown University Center on Education and the Workforce. Retrieved from http://nces.ed.gove/programs/projections/projections2020/sec5c.asp

National Center for Education Statistics (2014b). *Undergraduate enrollment*. Washington, DC: Georgetown University Center on Education and the Workforce. Retrieved from http://nces.ed.gov. /programs/coe/indicator_cha.asp

National Center for Education Statistics (2014c). *The condition of education - participation in education - postsecondary enrollment - undergraduate enrollment indicator*. Washington, DC: Georgetown University Center on Education and the Workforce. Retrieved from http://nces.ed.gov/programs/coe/indicator_chb.asp

National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Retrieved from http://www.2.ed.gov/pubs/NatAtRisk/recomm.html

Noddings, N. (1992). The challenge to care in schools: An alternative approach to education. *Advances in Contemporary Thought, Volume 8*. New York: Teacher's College Press. (ERIC Document Reproduction Service No. ED 377590) Retrieved from http://eric.ed.gov/?id=ED377590

Pajares, F. (1995). *Self-efficacy beliefs in academic settings*. Paper presented at the American Educational Research Association Symposium. San Francisco, CA. Session 39.10. (ERIC Document Reproduction Service No. ED 304608)

Pajares, F., & Miller, M.D. (1994). The role of self-efficacy and self-concept beliefs in mathematical problem-solving: A path analysis. *Journal of Educational Psychology, 86*, 193-203. doi: 1037/0022-0663.86.2.193

Pearson Higher Education. (2015). *Pearson My Math Lab®* Accessed from http://www.pearsonmylabandmastering.com/northamerica/mymathlab/

Piaget, J. (1972.) *The psychology of the child*. New York: Basic Books.

Preston, P.A. (1986). *Math anxiety: Relationship with sex, college major, mathematics background, mathematics achievement, mathematics performance, mathematics avoidance, self-rating of mathematics ability, and self-rating of mathematics anxiety as measured by the revised anxiety rating scale (RMARS)*. (Doctoral dissertation).

University of Tennessee, Knoxville, TN. Retrieved from http://trace.tennessee.edu/utk_graddiss/1252

Reed, A. (2015, February 9). Online student retention requires a collaborative approach. *Faculty Focus*. Retrieved from www.facultyfocus.com/articles/distance-learning/online-student-retention-collaborative-approach/

Rives, B. (1992). *A structural model of factors relating to success in calculus, college algebra and mathematics*. (Doctoral dissertation). University of Houston, Houston, TX.

Robicheaux, R. (1996). Professional development: Caring teachers can realize the vision of the standards. *Mathematics Teaching in the Middle School, 1*(9), 738-42. (ERIC Document Reproduction Service No. EJ520692) Retrieved from http://eric.ed.gov/?id=EJ520692

Ross-Gordon, J.M. (2011). Research on adult learners: Supporting the needs of a student population that is no longer traditional. *Peer Review, 13*(1). Retrieved from https:www.aacu.org/publications-research/periodicals/research-adult-learners-supporting-needs-student-population-no

Rossi Becker, J. (1992). Graduate education in the mathematical sciences: Factors influencing women and men. In Leone Burton (Ed.) *Gender and Mathematics*. Birmingham, UK: Cassell Educational Limited.

Saritas, T., & Akdemir, O. (2009) Identifying factors affecting the mathematics achievement of students for better instructional design. *International Journal of Instructional Technology and Design, 6(*12). Retrieved from http://itdl.org/Journal/Dec_09/article03.htm

Shih, C.C., & Gamon, J. (2001). Web-based learning: Relationships among student motivation, attitude, learning styles, and achievement. *Journal of Agricultural Education, 42*(4), 12-20.

Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: effects of motivation, interest, and academic engagement. *Journal of Educational Research, 95*(6), 323-332. doi: 10.1080/00220670209596607

Stage, F., & Kloosterman, P. (1995). Gender, beliefs, and achievement in remedial college-level mathematics. *The Journal of Higher Education, 66*(3) 294-311. doi: 10.2307/2943893 Retrieved from http://www.jstor.org/stable/2943893

Suarez, G., & Sandiford, J. (2008). Causal attributions for success or failure of students in college algebra. *Community College Journal of Research and Practice, 32*, 325-346.

Texas Higher Education Coordinating Board. (2016). *Lower division academic course guide manual.* Retrieved from www.thecb.state.tx.us/reports/pdf/7341.pdf?CFID=4129256&CFTOKEN=57044283

Texas Workforce Investment Council. (September 2008). *Annual report for fiscal year (FY) 2008*. Retrieved from gov.texas.gov/files/twic/FY_2008_TWIC_Annual_Report.pdf

Thayer-Bacon, B.J., Arnold, S., & Stoots, J. (1998, April). *Identification of caring professors in teacher education programs.* Paper presented at the annual meeting of the American Educational Research Association. San Diego, CA. (ERIC Document Reproduction Service No. ED 418970)

Thomas, J., Raynor, M., & Al-Marzooqi, A. (2012). Marital status and gender as predictors of undergraduate academic performance: A United Arab Emirates context. *Learning and Teaching in Higher Education: Gulf Perspectives, 9*(2), 1-9. Retrieved from http://lthe.zu.ac.ae/index.php/lthehome/article/view/80

Tinto,V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press. In Noel-Levitz, Inc. (2008). *Noel-Levitz*

Retention Codifications Student Success, Retention, and Graduation: Definitions, Theories, Practices, Patterns and Trends, p. 6. Retrieved from www.noellevitz.com

Tobias, S. (1993). *Overcoming math anxiety: Revised and expanded*. New York: W.W. Norton & Co.

U.S. Census Bureau. (2014). *Educational attainment in the United States*. Retrieved from https://www.census.gov/newsroom/press-releases/2015/cb15-tps03.html

U.S. Census Bureau. (2011). *Efforts to boost college attainment in Texas are key to achieving goal 2025*. Retrieved from https://www.census.gov/hhes/socdemo/education/data/cps/2011/tables.html

U.S. General Accounting Office (USGAO). (2014). *Science, technology, engineering and math in education: Assessing the relationship between education and the workforce.* GAO 14-374. Retrieved from http://www.gao.gov/assets/670/663079.pdf

Végh, L.L. (2000). *Elements of secondary school climate and the relationship between student achievement, student attendance, and teacher attendance in South Texas*. (Doctoral dissertation). Texas A&M University-Corpus Christi, Corpus Christi, TX and Texas A&M University-Kingsville, Kingsville, TX.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner & E. Souberman., Eds.) (A. R. Luria, M. Lopez-Morillas & M. Cole [with J. V. Wertsch], Trans.) Cambridge, MA: Harvard University Press. (Original manuscripts [ca. 1930-1934])

Wang, Z., Hart, S.A., Kovas, Y., Lukowski, S., Soden, B., Thompson, L.A., & Petrill, S.A. (2014). Who is afraid of math? *Journal of Child Psychology and Psychiatry, 55*(9), 1056-1064. doi: 10.1111/jcpp.12224 Retrieved from www.sciencedaily.com/releases/2014/03/140317095843.htm

Warren, J.R., LePore, P.C., & Mare, R.D. (1997, May). *Employment during high school: Consequences for students' grades in reading and mathematics*. Paper presented at the annual meeting of the Population Association of America. Washington, D.C. [CDE Working Paper #96-23]. Retrieved from https://www.ssc.wisc.edu/cde/cdewp/96-23.pdf

Weiner, B. (1979). A theory of motivation for some classroom experiences. *Journal of Educational Psychology, 71,* 3-25.

Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York, NY: Springer-Verlag.

Wigfield, A., & Eccles, J.S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review*, *12*, 265-310. doi: 10.1016/0273-2279 (92)90011-P

Wingenbach, G.L. (2000). Agriculture students; computer skills and electronic exams. *Journal of Agricultural Education, 41*(1), 69-78. doi: 10.5032/jae.2000.01069

Xia, N. (2010). *Family factors and student outcomes.* (Doctoral dissertation). Retrieved from Pardee Rand Graduate School Dissertations. Santa Monica, CA: Rand Corporation. (ERIC Document Reproduction Service No. ED508205)

Zakaria, E., & Nordin, N.M. (2007). The effects of mathematics anxiety on matriculation students as related to motivation and achievement. *Eurasia Journal of Mathematics, Science & Technology Education, 4*(1), 27-30. Retrieved from http://www.ejmste.com/v4n1/Eurasia_v4n1_ zakaria_nordin.pdf

APPENDIX A

Math Behaviors and Math Beliefs
Survey Instrument

Math Beliefs and Behaviors

Q0 If you are 18 years of age are older, please complete the following survey by reading the following questions or statements and select your answer(s). In completing the survey, you are giving your consent to the researcher to use the data from this study. At no time will your grades or your status at the college or its sites be affected by participation or non-participation.

Student ID

Math 1314 section___?

date - month/day/year

Q1-10 Please use a five-point rating to report how much you agree or disagree with each math belief described (1 = strongly disagree, 2 = mildly disagree, 3 = do not know, 4 = mildly agree, 5=strongly disagree)

	strongly disagree	mildly disagree	do not know	mildly agree	strongly agree
1. I can learn the math material without coming to class.	❍	❍	❍	❍	❍
2. Being good at math will help me in my future professional life.	❍	❍	❍	❍	❍
3. I can get a good grade in math even if I skip classes.	❍	❍	❍	❍	❍
4. I can get a good grade in math even if I skip the assigned homework.	❍	❍	❍	❍	❍
5. Getting a bad grade in math will not seriously affect my future employment possibilities.	❍	❍	❍	❍	❍
6. Getting a bad grade in math will not seriously affect my future financial well-being.	❍	❍	❍	❍	❍
7. Getting a bad grade in math will not seriously affect the completion of my college degree.	❍	❍	❍	❍	❍
8. If I miss math classes, I can always learn it on my own from the textbook.	❍	❍	❍	❍	❍
9. If I miss math classes, I can always catch up later.	❍	❍	❍	❍	❍
10. If I skip homework assignments, I can always catch up later.	❍	❍	❍	❍	❍

Q11-17 Please use a five-point rating to report how much you agree or disagree with each math belief. (1= strongly disagree, 2 = mildly disagree, 3 = do not know, 4 = =mildly agree, 5 = strongly agree).

	strongly disagree	mildly disagree	do not know	mildly agree	strongly agree
11. I am confident that I can get a passing grade in math.	❍	❍	❍	❍	❍
12. I am confident that I can get an A in math.	❍	❍	❍	❍	❍
13. If I miss a math class, I am confident that I can make up the work.	❍	❍	❍	❍	❍
14. Even if I do not understand a math problem at first, I am confident I will get it eventually.	❍	❍	❍	❍	❍
15. Math seems easy for me and I am confident I will get a good grade in this math class.	❍	❍	❍	❍	❍
16. If I get a bad grade on a math test, I know I can do better next time with more practice.	❍	❍	❍	❍	❍
17. I am confident I can practice math problems by myself until I understand them	❍	❍	❍	❍	❍

Q18-28 Please use a five-point rating to report how much you agree or disagree with each math belief described. (1 = strongly disagree, 2 = mildly disagree, 3 = do not know, 4 = mildly agree, 5 = strongly agree.)

	strongly disagree	mildly disagree	do not know	mildly agree	strongly agree
18. I have trouble remembering the steps in solving math problems.	❍	❍	❍	❍	❍
19. My parents have told me that I am bad at math.	❍	❍	❍	❍	❍
20. My teachers have told me that I am bad at math.	❍	❍	❍	❍	❍
21. My friends have told me that I am bad at math.	❍	❍	❍	❍	❍
22 . When I am taking a math exam, I feel tense and have trouble breathing.	❍	❍	❍	❍	❍
23. When I do math problems, I feel nervous.	❍	❍	❍	❍	❍
24. When I do math problems, I feel frustrated and angry.	❍	❍	❍	❍	❍
25. When I do math problems, I feel stupid.	❍	❍	❍	❍	❍
26. When I get confused about something in math, I feel embarrassed.	❍	❍	❍	❍	❍
27. When I am taking a math exam, I forget everything that I have practiced.	❍	❍	❍	❍	❍
28. I cannot concentrate on math for more than short periods of time.	❍	❍	❍	❍	❍

Q29 What is your age (in years)?

- ❍ 18 years-25 years
- ❍ 26years -35 years
- ❍ 36 years - 45 years
- ❍ 45 years and older

Q30 What is your zip code?

Q31 Which Coastal Bend College campus do you attend? (Select all that apply.)

- ❑ Alice
- ❑ Kingsville
- ❑ Beeville
- ❑ Pleasanton
- ❑ on more than 1 campus (excluding internet)

Q32 What is your classification in college?

- ❍ first semester
- ❍ second semester
- ❍ third semester
- ❍ fourth semester
- ❍ over four semesters

Q33 What is your gender?

- ❍ male
- ❍ Female

Q34 If you are employed, how many hours per week do you work?

- ❍ less than 10 hours per week
- ❍ 10-20 hours per week
- ❍ 21-30 hours per week
- ❍ 31-40 hours per week
- ❍ over 40 hours per week

Q35 What is the number of children you care for in your family including step children?

- ❍ 0-2 children
- ❍ 3-4 children
- ❍ 5 - 6 children
- ❍ more than 6 children

Q36 What is the number of miles distance you live from the Coastal Bend College campus (may be an approximation)

- 0-10 miles from campus
- 11-20 miles from campus
- 21-30 miles from campus
- more than 30 miles from campus

Q37 What is your marital status?

- married
- divorced
- single
- other

Q38 What is your area of study, your degree plan?

- Education
- Science
- Mathematics
- English/Reading
- History
- Philosophy/Psychology
- Kinesiology
- Undecided

Q39 What is your racial or ethnic identity?

- American Indian or Alaskan Native
- Hispanic or Latino
- Black or African American
- White or Caucasian, not of Hispanic origin
- Asian or Pacific Islander
- Other

APPENDIX B

Letter of Invitation E-Mail
with
Information Sheet

Hello,

I am Mrs. Hill, a math instructor at Coastal Bend College on the Beeville campus. I am conducting a research project studying the beliefs and behaviors of students in college algebra. The purpose of this project is to gain insight on beliefs that students in college algebra have about math and learning and the behaviors that coexist with these beliefs. You have been selected as a possible participant since you are a CBC college algebra student this semester.

If you are 18 years of age or older and agree to participate you will be asked to answer 39 questions in this online survey. The survey will take about 10-15 minutes. Your participation is greatly appreciated.

Please click here

Follow this link to the Survey:

Take the Survey

Or copy and paste the URL below into your internet browser:

https://tamucc.col.qualtrics.com/SE?Q_DL=3UHskXpC50ln2iF_3VLqxz8tED1iqLH_MLRP_e51FQifxNCBZaJ&Q_CHL=e-mail

Follow the link to opt out of future e-mails:

Click here to unsubscribe

Thank you,

Mrs. Bobbie Jo Hill

Professor of Mathematics

Coastal Bend College

Further information:

This study is confidential and records of this study will be kept confidential. At no time will your grade or standing at CBC be affected by participation or lack of participation in this study. Your course grade, your attendance, and the number of times you attended tutoring will be collected along with the answers to the survey. Research records will be stored securely and only I will have access to them. If you have any questions, contact me at hillb@coastalbend.edu. IRB approval has been given for this study by CBC and Texas A&M Corpus Christi.

Again, thank you for taking the survey

**INFORMATION
SHEET**

Math Beliefs
and Behaviors

The purpose of this form is to provide you information that may affect your decision as to whether or not to participate in this research study. By filling out the survey, Math Beliefs and Behaviors, you are consenting to participate in the study. By participating in this study, you are also certifying that you are 18years of age or older. Please do not fill out the survey, Math Beliefs and Behaviors, if you do not consent to participate in the study.

You have been asked to participate in a research project study, Recognizing and Describing Math Beliefs and Behaviors and Performance in College Algebra. The purpose of this study is to recognize and describe beliefs and behaviors of students in college algebra and the relationship with student performance. You were selected to be a possible participant because you are enrolled in Math 1314college algebra this semester, Fall 2015. This study is being guided by Bobbie Jo Hill, Professor of Mathematics at Coastal Bend College.

What will I be asked to do?

If you agree to participate in this study, you will be asked to participate in online survey of 40 short answer questions. This study will take 15-20 minutes.

What are the risks involved in this study?

The risks associated with this study are breach of confidentiality and pressure to participate. At no time will your identity be known by anyone in the study aside from Professor Bobbie Jo Hill. Your grade and status at Coastal Bend College will in no way be affected by this study. Data will be stored on a Coastal Bend College computer located in the primary researcher's instructor office with password protection enabled. Back-up storage of data will be on a flash-drive stored in a locked file cabinet in the same instructor's office at Coastal Bend College.

What are the possible benefits of this study?

You will receive no direct benefit from participating in this study; however, identifying and describing the beliefs and behaviors of students in college algebra will assist instructors, administrators, curriculum designers, and textbook companies to provide more beneficial support to students.

Do I have to participate?

No. Your participation is voluntary. You may decide not to participate or to withdraw at any time without your current or future relations with Texas A&M University-Corpus Christi and/or Coastal Bend College being affected.

Who will know about my participation in this research study?

This study is confidential and only Professor Bobbie Jo Hi11 of Coastal Bend College will have access to the survey results. You will be asked to provide your student ID on the survey, this will be used to identify your final course grade, your attendance in the course, the number of times attending tutoring, and your homework grade in the course. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only by Professor Bobbie Jo Hill will have access to the records. All data will be securely stored at Coastal Bend College.

Whom do I contact with questions about the research?

If you have questions regarding this study, you may contact Professor Bobbie Jo Hill, 361-354-2403, hillb@coastalbend.edu.

Whom do I contact about my rights as a research participant?

This research study has been reviewed by the Research Compliance Office and/or the Institutional Review Board at Texas A&M University-Corpus Christi. For research-related problems or questions regarding your rights as a research participant, you can contact Erin Sherman, Research Compliance Officer, at (361) 825- 2497 or erin.sherman@tamucc.edu

APPENDIX C

Script for
Face-to-Face
Classes
Introduction to Survey

Script for Face-to-face Classes Introduction to Survey

Students:

My name is Bobbie Jo Hill and I am a mathematics instructor at Coastal Bend College in Beeville. I am doing a study on the beliefs and behaviors that students who are successful in college algebra exhibit. I am asking for your assistance in this study. I have sent you all an e-mail and at the bottom of the e-mail there is a link to a short survey on your beliefs and opinions about mathematics and learning. It should not take you more than 15-20 minutes to complete. Your participation will help improve the learning experience of many more students in college algebra. Gentlemen the data collected from this study will not be included but I am interested equally in your answers. At no time will your identity be used nor will your grade be affected. Your final course grade, your attendance in college algebra, your homework grade, and your attendance in tutorials will be used to identify behaviors of students. This data will be statistically examined for significant patterns. It will be destroyed after the statistical tests are completed and until that time will be securely kept in a password protected CBC computer. I appreciate your help and wish you the best this semester.

Please go to your e-mail and open College Algebra Survey.

Thank you.

APPENDIX D

Correspondence
with
Dr. Helen Hendy

5/26/2015
From: “Dr. Helen Hendy” <h14@psu.edu>
To: “Bobbie Jo Hill” <hilb@coastalbend.edu>
Cc: “bwade” <baw180@psu.edu>, nss11@psu.edu
Subject: Re: Measurement of math beliefs and behaviors
Date: 5/22/2015 1:46:10 PM

Hello Dr. Hill-

Thank you for your interest in our measurements of math beliefs in college students. I have attached an easy-to-use guide we developed to help researchers and educators deliver the three measures.

Best wishes for your research! Helen Hendy

From: Bobbie Jo Hill [mailto:hillb@coastalbend.edu]
Sent: Friday, May 22, 2015 12:50 PM
To: hl4@psu.edu
Cc: hillb@coastalbend.edu
Subject: Measurement of math beliefs and behaviors

Dr. Hendy,

My name is Bobbie Jo Hill and I am a professor of mathematics at Coastal Bend College in Texas and I also am a doctoral student at Texas A&M Corpus Christi. My dissertation is on factors and motivators profiling women successful in college algebra in rural community colleges of South Texas. I have recently found your article on measurement of math beliefs and their association with math behaviors in college students. I am particularly interested in motivation, attitude and self-efficacy in math and my students. The survey that you designed in your study may be of particular importance to me in my work.

Would you consider giving me permission to use your survey in my work? If so, would you send me the official survey and the means to assess it? I would greatly appreciate the help and time and expertise that this would lend to my study. I am most interested in helping my students in math be successful with the tools necessary to support them.

My deepest appreciation for any help you might be willing to give.

Respectfully,

Bobbie Jo Hill
Professor of Mathematics
Coastal Bend College
hillb@coastalbend.edu